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THE

VOYAGE OF H.M.S. CHALLENGER.

ZOOLOGY.

REPORT on the HUMAN CRANIA AND OTHER BONES OF THE SKELETONS collected during the Voyage of H.M.S. Challenger, in the years 1873–1876. By WILLIAM TURNER, M.B., LL.D., F.R.SS. L. & E., Professor of Anatomy in the University of Edinburgh, Foreign Member of the Anthropological Society of Paris.

PART I.—THE CRANIA.

DURING the voyage of H.M.S. Challenger Human Crania and Skeletons were collected at several of the ports at which the ship called. These were entrusted to me by Sir C. Wyville Thomson on the return of the expedition. They consisted of specimens from the following localities:—

The Admiralty Islands,
Hawaii, Sandwich Islands,
Oahu, Sandwich Islands,
Chatham Islands,
New Zealand,
Australia,
Tierra del Fuego,
Patagonia,
Bush Race, from South Africa.

In this part the Crania only are described. The other bones will form the subject of a short second part in a subsequent volume.

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HUMAN CRANIA.

INTRODUCTION.

In the description of these crania I have to a large extent adopted the terms and craniometrical methods introduced by the late M. Paul Broca, which have contributed so much to give exactness to craniological research. It is not necessary that I should enter here into any detailed explanation of the meaning of the terms which he has proposed with so much advantage. For not only are they amply defined in his own writings, more especially in his well-known Instructions Craniologiques et Craniometriques,[1] but a sufficient explanation of them is furnished to all English readers in the translation of Dr. Topinard's Anthropologie,[2] and in Prof. Flower's Catalogue of the Human Crania in the Museum of the Royal College of Surgeons of England.[3]

It will, however, be advisable to say a few words about some of the craniometrical methods which I have employed. For unfortunately there are in use by craniologists so many different ways of measuring even the principal dimensions of the skull, that it becomes necessary for each investigator to preface his description by stating the method that he has himself pursued.

As it is important in all craniological enquiries to obtain an average from as large a number of specimens as possible, I have not restricted myself to the examination and mensuration of the skulls collected during the voyage of the Challenger; but have, whenever practicable, studied along with them skulls from the same localities, preserved either in the Edinburgh University Anatomical Museum or in other collections in this city. This Report has therefore become an essay on the craniology of certain Races of Men.

The measurements have been made with instruments supplied by M. Mathieu of Paris. They are recorded in millimètres. In calculating the indices when the fraction was below ·5 I have not taken it into account. When ·5 or above ·5, I have either stated it or given the benefit of the fraction to the preceding whole number.

In each table of measurements I have recorded the length both from the most projecting mid-occipital point to the ophryon, and from the mid-occipital point to the most prominent part of the glabella. I have not thought it necessary specially to record

[1] Paris, 1875.

[2] Translated by Dr. R. T. H. Bartley. Library of Contemporary Science, London, 1878.

[3] London, 1879.

the diameter from the mid-occipital point to the fronto-nasal suture (nasion), which is the dimension taken by Professors van der Hoeven,[1] Cleland[2] and Virchow,[3] for I find that as a rule it approximates to the ophryo-occipital diameter. In many specimens, more especially in female skulls, the difference between the ophryo-occipital, nasio-occipital and glabello-occipital diameters, does not amount to more than two or three millimètres, and it is only when a great development of the frontal air-sinuses and of the glabella takes place, that the difference in these three diameters becomes very distinctly marked.

The greatest breadth recorded in the table is taken in the parietal or parieto-squamous region, wherever it occurs, and the letters *p* and *s* appended to the measurement express whether this maximum breadth be situated at or near the parietal eminence, or at or near the parieto-squamous suture. The greatest breadth and the glabello-occipital diameter have been taken therefore in the manner proposed by the illustrious Retzius,[4] the founder of scientific craniometry.

The length-breadth or cephalic-index has been calculated from the relations between the greatest breadth and the glabello-occipital length,[5] but those craniologists who desire to take the ophryo-occipital length as the basis of their calculation have the data furnished in the tables. I have preferred the glabello-occipital length as a basis for calculating the cephalic index, rather than the ophryo-occipital diameter, which has been adopted by Dr. Barnard Davis[6] and by Professors Rolleston[7] and Flower.[8] For the ophryon has not the same definite position as the glabella, and observers do not always agree in localising the ophryon at the same point on a skull. To ignore the glabella in estimating the extreme length of the cranium, is to leave out of consideration an eminence which in many skulls and heads constitutes one of the most noticeable features in the frontal region, and which is so frequently an important sexual character. Moreover, it seems to me that with the skull as with the living head, our object should be to compare the greatest length and greatest breadth with each other wherever they occur, and not to confine our measurements to those parts of the skull which more directly form the wall of the brain cavity.

I have arranged the crania according to the proportions of length and breadth into three categories and have adopted M. Broca's term mesaticephalic, to express a group between the dolichocephalic and brachycephalic types of skull.

I have not thought it necessary to adopt those minor subdivisions of sub-dolichocephalic

[1] Catalogus craniorum diversarium gentium, Leyden, 1860.

[2] Variations of the human skull, &c., *Phil. Trans.*, 1869.

[3] *Archiv für Anthropologie*, vol. iv. p. 59, 1870.

[4] Müllers *Archiv*, 1845, p. 126, and Ethnologische Schriften, pp. 24–166.

[5] The glabello-occipital length is merely another mode of expressing the diameter subsequently named by M. Broca, the antero-posterior maximum.

[6] Although Dr. Davis states that his measurement is taken from the glabella, yet as he regards that "as about an inch above the fronto-nasal suture," it obviously approximates closely to the ophryon.

[7] British Barrows, p. 560, 1877, and collected Scientific Papers and Addresses edited by Prof. Turner, p. 165, Oxford, 1884.

[8] Catalogue of Human Crania, p. xvii. 1879.

and sub-brachycephalic which M. Broca,[1] and Dr. Thurnam,[2] have employed, or a somewhat similar series of terms suggested by Prof. Huxley;[3] for, however interesting such subdivisions may be in recording the indices of individual skulls, they are really of little practical value in expressing differences of race; and by giving an appearance of minute accuracy under conditions which are variable within certain limits, they are apt to give an importance to groups, the numerical limits of which are quite arbitrary, greater than they actually possess. The numbers which I have employed to mark the limits of each of the three groups are similar to those used by Prof. Flower:—*e.g.*, Dolichocephalic, below 75; Mesaticephalic, 75 to 80; Brachycephalic, above 80.

The vertical or altitudinal index has been calculated from the relations between the basi-bregmatic height and the glabello-occipital length. It is, therefore, an expression of the relation of length to height. Data for calculating the relation of breadth to height and of forming therefore a breadth-height index, are provided in the tables. The terms platycephalic or tapeinocephalic have been suggested by various craniologists, to indicate skulls with a low vertical index, and akrocephalic or hypsicephalic[4] to express those whose index is high. For skulls of intermediate or moderate altitude I have used the term metriocephalic. The following classification of skulls in accordance with the relations of length and height is adopted in this Report:—Tapeinocephalic, below 72; Metriocephalic, between 72 and 77; Akrocephalic, above 77.[5]

The minimum frontal, stephanic, and asterionic diameters have been taken according to the methods prescribed by M. Broca. In many instances, though not in all, the stephanic diameter gives the greatest diameter in the region of the frontal bone.

The horizontal circumference has been obtained with a graduated tape line, by measuring from the most projecting part of the glabella around the occipital point back to the glabella. The total longitudinal arc is the distance in a curved line from the nasion over the vertex, to the opisthion, and the proportions contributed to this arc by the frontal, parietal, and occipital bones respectively, are also stated. The vertical transverse arc is measured from the supra-auricular point over the bregma to the corresponding

[1] *Bulletins de la Société d'Anthropologie*, t. i. p. 507, 1861; La classification et la nomenclature craniologiques in *Revue d'Anthropologie*, t. i. p. 385, 1872.

[2] Ancient British and Gaulish Skulls, *Memoirs of the Anthropological Society of London*, vol. i. 1865.

[3] Prehistoric Remains of Caithness, p. 85, 1866.

[4] M. M. de Quatrefages and Hamy (Crania Ethnica, *passim*) call a skull hypsistenocephalic when the vertical index is higher than the cephalic index.

[5] In a recent number of the *Archiv für Anthropologie*, Bd. xv., 1st and 2nd Vierteljahrsheft, 1884, published after the above Report was in type, Professors Kollmann, Ranke and Virchow in recommending certain terms and methods to be employed by craniologists suggest the following to express the altitudinal index; Chamæcephalic (flat skulls) up to 70·; Orthocephalic from 70·1 to 75·; Hypsicephalic (high skulls) 75·1 and upwards. The term metriocephalic, which I have suggested in the text is, I would submit, to be preferred to that of orthocephalic, because it expresses like the well known terms mesaticephalic and mesocephalic, a form intermediate between two extremes (μέτριος moderate), whilst the word ὀρθός has no special relation to this intermediate index. Besides the term orthocephalic had previously been used by Prof. Welcker to express the *breadth* index of a group of skulls intermediate between the dolichocephalic and brachycephalic.

point on the opposite side. I have not thought it necessary to give the inferior measurement below the base of the skull between the two supra-auricular points.

I have determined the relative projection of the zygomatic arches as compared with the transverse diameter of the cranium, by placing the skull, without the lower jaw, on a low table, resting it on the teeth and the most depending parts behind. Then, standing erect, I have looked down on the vertex with the right eye directed to the bregma and with the left closed. The terms phænozygous and cryptozygous employed by Mr. Busk have been used to express whether, from this point of view, the zygomata were visible or invisible.

The basi-nasal and basi-alveolar diameters have been taken from the basion, in the one case to the nasion, in the other to the alveolar point, and the gnathic index has been calculated from the $\frac{\text{basi-alveolar length} \times 100}{\text{basi-nasal length}}$. The classification employed by Flower into Orthognathous below 98 ; Mesognathous from 98 to 103 ; Prognathous above 103 has been adopted. The basion has therefore been taken as an important central point for determining the length in a straight line from it to the alveolar point, the nasion, and the bregma.

The length of the foramen magnum from basion to opisthion is given. This measurement, along with the basi-nasal length, and the longitudinal arc, also recorded in the tables, will enable the entire circumference of the cranial box mesially and antero-posteriorly to be computed.

The interzygomatic breadth is the distance between the most projecting parts of the zygomatic arches. The intermalar breadth has been taken on a line with the hinder border of the orbital process. The ophryo-alveolar length is measured from the ophryon to the alveolar point, and the naso-alveolar length from the nasion to the same point. The facial index expresses, according to the method of Broca, the relations of the interzygomatic breadth to the ophryo-alveolar length, and is arrived at by the following formula : $\frac{\text{Ophryo-alveolar length} \times 100}{\text{Bizygomatic diameter}}$. I do not attach much importance to a facial index based upon the ophryo-alveolar length; partly on account of the imperfect definition of the ophryon, and partly because the lower jaw is left out of consideration in the determination of the length of the face. The nasal and orbital measurements, with their respective indices, have been taken according to the methods of M. Broca, and the classification employed by Broca and by Flower has been adopted: *e.g.*, Nasal index, Leptorhine, below 48 ; Mesorhine, from 48 to 53 ; Platyrhine, above 53 : Orbital index, Microseme, below 84 ; Mesoseme, from 84 to 89 ; Megaseme, above 89.

Professor Broca also estimated [1] the dimensions of the hard palate without including the dentary arcade. Professor Flower modified and improved these measurements by

[1] Instructions Craniologiques, p. 77.

including the dentary arcade along with the hard palate.[1] He makes the length of the palate to extend from the alveolar point to a line drawn across the hinder borders of the maxillary bones, and its width between the outer borders of the alveolar arch immediately above the middle of the second molar tooth. Instead, however, of using the terms maxillary length, width, and index, which Professor Flower employs, I prefer to call these measurements palato-maxillary[2] or palato-alveolar, as expressing more precisely their nature. As considerable differences exist in the relative length and breadth of the palato-maxillaries in different individuals, it is advisable to have descriptive terms to express the different value of the palato-maxillary index. To follow the rule pursued by craniologists, terms compounded of Greek words should be employed. As οὐρανὸς signifies the vault or roof of the mouth, the term Dolichuranic would indicate a palato-alveolar region where the length is to the breadth proportionally great, so that the roof of the mouth is elongated, and Brachyuranic would express the opposite condition, in which the roof of the mouth approaches more to the semi-circular in form; whilst Mesuranic would of course indicate a region intermediate in its proportions. The Latin terms longi-palatal, brevi-palatal, and medio-palatal would be equally appropriate. The following classification, based on differences in the palato-alveolar region, has been introduced into the Report:—Dolichuranic, index below 110; Mesuranic, between 110 and 115; Brachyuranic above 115.

The measurements of the lower jaw scarcely require any explanation, but I may state that the breadth of the ascending ramus is its antero-posterior diameter on a line with the alveolar border.

In determining the age of a skull, I have relied on the condition of the sutures and on the dentition. When the sutures of the cranial vault were ossified, both in the inner and outer tables, and when the teeth were either much worn down or shed, and the sockets absorbed, the skull is then said to be "aged." When the teeth were all erupted, except perhaps one or two of the wisdoms, and either slightly or moderately worn, and the sutures either unossified or only partially obliterated, the skull is called "adult." The age of the skull in childhood and youth has been arrived at by observation of the state of the milk and permanent dentition.

In determining the sex I have relied, in the comparison of the skulls of each race, on the greater size, weight and capacity, on the projection of the glabella, supraciliary ridges, mastoid processes, inion, and superior curved occipital line, and on a more backward slope of the frontal region as characteristic of male skulls. Whilst a more feeble development of the ridges and projections which mark the position of air-sinuses and attachment of muscles; smaller size and capacity; a fuller occipital squama as compared with the inion

[1] Cranial characters of natives of Fiji Islands, *Journ. of Anthrop. Inst.*, Nov. 1880.

[2] See abstract of my communication on the Crania of the Admiralty Islanders, *Trans. International Medical Congress*, vol. i. p. 146, 1881, and in *Journ. Anat. and Phys.*, vol. xvi. p. 135.

and curved line; a more vertical forehead, a greater flattening of the vertex and consequently a diminished height of the skull, with frequently, though not invariably, a greater breadth of the cranium in the region of the parietal eminences than near the squamous suture, have been regarded as characteristic of female skulls.[1]

A careful enquiry into these different characters will, without much difficulty, enable the craniologist to pronounce definitely as to the sex of a large proportion of the human crania which may be submitted to him for examination. But in large collections of skulls there are always specimens the characters of which are not sufficiently pronounced to enable one to state with certainty to which sex they had belonged. Various specimens of this kind have been distinguished in the tables which accompany this memoir by a query.

In determining several of the indices I have in many instances been saved the labour of calculation by employing the very useful tables which Professor Flower has appended to his catalogue of the human crania in the Museum of the Royal College of Surgeons of England.[2]

The determination of the internal or cubic capacity of the cranial cavity, so as to ensure accuracy and uniformity in result is admittedly one of the most difficult measurements to be undertaken by the craniographer. The amount of shot, or sand, or glass beads, or seeds of different kinds which a skull can contain varies, as has been pointed out, especially by M. Broca,[3] Dr. Wyman,[4] M. Topinard,[5] and Dr. E. Schmidt,[6] with the size of the particles, with the dimensions of the funnel through which they are poured into the cranial cavity, with the rapidity of their flow, and with the extent to which the skull is shaken and the particles made to subside and be compacted together. In a similar manner, the estimation of the amount of the material poured into a skull varies with the height of the cubic measure, with the rate at which the substance is poured into the measure, and with the amount of succussion to which it is subjected. M. Broca strove to give uniformity to the guaging and cubage of a skull by always employing shot of a definite size (No. 8), by pouring it through a funnel, the neck of which had a narrow diameter, and by ramming the shot when in the skull so as to ensure the closest possible approximation of the particles. The shot was then emptied from the skull into measures of a definite height, with the aid of a funnel having a neck of a particular diameter.

[1] M. Broca's Instructions Craniologiques, already cited, and Prof. Ecker's article in *Archiv für Anthropologie*, Bd. i. p. 83, may be consulted with great advantage on the sexual characters of crania.

[2] Professor Welcker has also given in the *Archiv für Anthropologie*, Bd. iii. Heft 3, excellent tables for the determination of the indices of breadth and height.

[3] *Mém. de la Soc. d'Anthropologie de Paris*, sér. 2, t. i. p. 63, 1872, also t. ii. p. 1 ; and Instructions Craniologiques.

[4] Observations on Crania, *Proc. Boston Soc. Nat. Hist.*, vol. xi., April, 1868.

[5] Anthropology, English translation, p. 226, and more fully in *Revue d'Anthropologie*, t. v. p. 385, 1882. I wish to express my obligations to M. Paul Topinard for the interesting demonstration which he gave me of the mode of using M. Broca's method for obtaining the cubic capacity and the precautions which it is necessary to employ in order to avoid error.

[6] *Archiv für Anthropologie*, Bd. xiii. p. 53, 1882.

In this way uniform results can undoubtedly be arrived at, but as is now admitted the cubage so obtained gives a higher numerical value to the contents than is the actual capacity of the cranium as tested by the employment of water for the purposes of cubage. This is not to be wondered at when it is remembered that the shot is rammed into the cranial cavity to its utmost capacity, whilst no corresponding pressure is applied to the shot after pouring it into the cubic measure, so that necessarily it occupies a greater space in the measure than in the skull. Dr. E. Schmidt, whilst recognising that Broca's method is not only the most practicable, but also the most precise of all the methods up to that time employed, has yet found it necessary to draw up tables by means of which the measurements taken according to Broca may be reduced to the actual capacity. Thus when shot is employed, whilst Broca's method would give 1000 cubic centimetres, the actual capacity is 931, making a difference of 69, and the difference gradually rises until a capacity of 1500 (Broca) is only 1409 (Schmidt), and one of 2000 (Broca) is 1887 (Schmidt), the difference between the apparent and real capacities in the last example being as much as 113 cc.

What is undoubtedly a desideratum in the determination of the cranial capacity is a method which will bring the two processes of guaging the skull and cubing its contents into precisely uniform conditions, so that the number obtained in the cubage may express the actual capacity. I have performed a number of experiments with this object, and have now elaborated a method which gives results so nearly uniform when tested with a standard skull, that it may, I think, be taken as furnishing in each case a close approximation to the actual capacity. This standard skull was itself prepared by stopping all the foramina, except the foramen magnum, with cement and by coating both the inner and outer tables with sealing wax varnish. The method is based upon two of the most important principles insisted on by Broca, viz., that the size of the particles employed must be uniform, and that they should be poured into the skull through a funnel, the neck of which has a definite diameter.

No. 8 chilled shot has been employed as, from its hardness, it preserves its globular form much more efficiently than ordinary shot.[1] A litre is filled with this shot, which is then poured into the foramen magnum through a funnel 14·5 centimetres wide at the mouth, and 12·5 cm. in depth, the spout of which is 2 cm. long and 2 cm. wide. The skull is then lifted in both hands and a sharp tilt forwards given to it so as to project the shot into the anterior and middle cranial fossæ. Shot is again poured in through the same funnel until it reaches the foramen magnum, care being taken that it shall pass well down into the occipital region. The skull is again lifted and a sharp tilt given, first

[1] I attach importance to the preservation of the globular form of the shot, as it thereby runs much more uniformly than if the particles were flattened or irregularly shaped. An objection to the method of ramming the shot employed by Broca is the constant change of form which the particles are made to undergo, and the alteration therefore in the number of their surfaces of contact.

to the right and then to the left. More shot is then poured through the funnel until it reaches the foramen, when the thumb is placed on the shot and pressed into the cavity downwards and backwards; the measure of resistance offered to the thumb expresses whether in the previous operation the cranial cavity has been properly filled. Shot is again poured through the funnel until the skull is filled to the foramen magnum. It will be observed that I do not ram the shot in the process of guaging, and do not therefore overfill the cavity.

In cubing the contents the shot is not poured into a litre and a demi-litre measure, as was the practice of M. Broca, but through the same funnel as that used in filling the skull into the large 2 litre glass cylinder graduated in intervals of ten centimetres, devised by Prof. Ranke of Munich, and for a gift of which I am greatly indebted to that eminent anthropologist.[1] Each skull was gauged and cubed at least twice, once by myself, and once by my museum assistant Mr. James Simpson. The figures stated in the tables are the mean of the two measurements, and in no case was a measurement accepted where a difference occurred of more than 10 cubic centimetres. When such a difference arose, as occasionally took place from inadvertence in not attending to some of the necessary precautions, the skull was at once remeasured. I have arranged the skulls according to their capacities into three divisions, and have employed the same numerical classification as Prof. Flower; viz.: Microcephalic below 1350; Mesocephalic between 1350 and 1450; Megacephalic above 1450 cubic centimetres.

BUSH RACE, SOUTH AFRICA.

Plates I., VI. Tables I., XVIII., XIX.

Two crania, both apparently males, were collected by the Challenger Expedition. In the same box were the pelvic bones and long bones of the limbs of one skeleton, but these were unfortunately so much injured that exact measurements could not be taken. No memorandum of the donor of these skulls has been preserved, but Mr. Murray thinks that they were presented by the late Dr. Bleek. Along with them were several stone implements shaped into lance heads, a large perforated stone ball, some fragments of pottery and two Ostrich eggs. I have examined along with these specimens five other Bush crania,[2] one of which was a child of about nine years, and the remarks which follow

[1] Prof. Ranke has since devised a reproduction of a skull in bronze, in which all the inequalities of the cranial cavity are reproduced, and which, from the imperviousness of its walls, both to water and mercury, enables either of these agents to be employed so as to obtain a definite standard of comparison. Prof. Ranke brought this bronze skull under the notice of the Deutsche Gesellschaft für Anthropologie, October 1882. See the Correspondenz Blatt, p. 137, in *Archiv für Anthropologie*, Bd. xv., 1884.

[2] One specimen was purchased for the University Anatomical Museum many years ago; a second, being the one figured in Plate I., was presented along with the skeleton by Dr. P. C. Sutherland and W. Proudfoot, Esq., of Natal. This man came from the mountains at the source of the Umzimkulu and St. John's river. He had been about twelve years

are based on the investigation of seven skulls. The six adult crania were with one exception probably all males.

Norma verticalis.—Crania elongated antero-posteriorly. Parietal eminences usually well marked, and placed near the back of the side of the skull. Frontal eminences distinct. Skull somewhat flattened on summit. No median ridge in sagittal region. Cryptozygous except in two specimens, in which the zygomatic arches were just visible. The stephanic diameter was in three specimens less than, in two equal to, and in two greater than, the asterionic.

Norma lateralis.—All the skulls rested behind on the cerebellar part of the occipital bone. In only one was there much projection of either the glabella or supraciliary ridges. In all the frontal bone ascended almost vertically from the glabella, and the frontal region of that bone passed somewhat abruptly into the coronal region. In three specimens a median ridge marked the position of the obliterated frontal suture. The tendency to flattening of the vault gave a low curve to the vertex. There was no marked flattening in the region of the obelion and upper occipital squama, such as would have been produced by artificial pressure. The squama projected behind the occipital protuberance. The frontal longitudinal arc was in each skull markedly greater than the occipital; in four specimens it was greater than the parietal; whilst the parietal was in five skulls greater than the occipital.

The nasal bones were not strongly developed; they never exceeded 25 mm. in length, and 7 mm. in breadth; not unfrequently they were partially fused together. The bridge of the nose was so flattened that the nasals formed almost a plane surface between the nasal processes of the superior maxillaries, and there was, with one exception, scarcely any depression at the naso-frontal suture. The nasal spine of the superior maxillæ was feeble. The junction of the side walls with the floor of the anterior nares was rounded. In five of the crania there was a marked depression in the frontal, immediately above the external angular process, which gave great prominence to that process. In five crania the infra-orbital and canine fossæ were deep, in two shallow. The infra-orbital part of the malar bones projected forwards and approximated to the plane of the lower border of the nasals, so that the face in the fronto-naso-orbital region was flattened. The interzygomatic breadth invariably exceeded the intermalar, stephanic or asterionic, but was considerably less than the interparietal breadth. The intermalar was in three cases greater than the stephanic, once equal to and twice somewhat less than it. The face

with Mr. Proudfoot, and died of phthisis. Two were presented by one of my pupils, Mr. W. J. van der Merwe. They were from his father's estate of Drift, Calvinia district. One was a male somewhat advanced in years, the other a child about nine. The adult skull which I believe to be female was lent to me in November 1883, by Adam Sedgwick, Esq., of Trinity College, Cambridge, to whom it was given by Dr. Theophilus Hahn, the Colonial Philologist. It came from Uitenhag in the eastern district. Although I did not receive this skull until after the bulk of the Report was in type, I have been able to include it in the table of measurements, and to incorporate its characters in the text.

was broad and flattened in the norma facialis. The mean interorbital breadth was 23·5 mm.; the maximum 27 mm.; the minimum 21 mm.

The teeth were fully erupted in five crania, and in the adult from Drift, Calvinia, the sockets of the lower molars and upper incisors and canines were absorbed. In one skull the upper wisdoms were only partially erupted, and in the child's skull the dentition marked the 8th or 9th year. Except in the child and one of the adults the teeth were much worn, even in the skull with imperfectly cut wisdoms, but there was no decay.

The cranial sutures in B were simple in their denticulations, the sagittal immediately in front of the obelion was deflected to the right, and small Wormian bones were in the lambdoidal suture. In the other skulls the sutures were more deeply denticulated, and small Wormian bones were not unfrequent in the lambdoidal suture. In three the sutures were in course of senile obliteration. No skull was metopic, and the temporal squama did not articulate with the frontal. The temporal ridges were not strong.

In two crania the ossa plana of the ethmoid were small. In one of these on both sides, and in the other on the right side only, the orbital plate of the superior maxillary sent a process between the os planum and the lachrymal to articulate with the frontal (Pl. I. fig. 4); when a fronto-maxillary articulation occurs in the inner wall of the orbit, it marks a reversion to the pithecoid arrangement, and is a sign of degradation of the human cranium; for in the Gorilla and other species of *Troglodytes* the os planum is triangular, and the frontal and superior maxilla articulate with each other between it and the lachrymal on the inner wall of the orbit. In two, faint indications of a maxillo-premaxillary suture were seen on the hard palate. The malar was not in any specimen divided either wholly or partially by a suture, and did not therefore conform to a character which Rolleston thought to be not unfrequent in Bush crania. One skull had a long right paramastoid which possessed a broad smooth articular surface at its lower free end for the transverse process of the atlas.

The lower jaw was present in six crania. In all the chin was feeble and with but a slight forward projection; the coronoid process was short, the sigmoid notch shallow, and the incisors almost vertical. The antero-posterior diameter of the ascending ramus, on a line with the alveolar border, was, as a rule, from 30 to 31 mm. In four adults the angle was everted at the insertion of the masseterics, very markedly so in two specimens, and there was only a slight hollowing on the inner surface of the ramus. In all the gonio-symphysial and intergonial diameters were either equal or almost equal.

In the six adult crania the mean cephalic index was 75·9, and the range of variation from the minimum 75 to the maximum 76·5 was only 1·5; the skulls were therefore mesaticephalic. The mean vertical index was 71, and the range from 69 to 73 was 4. The mean height was therefore distinctly below the mean breadth, and in no specimen did the height equal the greatest breadth; the skulls were tapeinocephalic. The mean gnathic index was 96·7, and the range from the minimum 92·6 to the maximum 102 was

9·4 ; the average was orthognathic, only one adult being mesognathic. The mean facial index was 65, and the range from 62 to 69 was 7. The mean nasal index was 54·85, and the range from 48 to 62·5 was 14·5 ; the mean was platyrhine, but the individual crania ranged from the lowest term of the mesorhine to the platyrhine. The mean orbital

TABLE I.—BUSH RACE, SOUTH AFRICA.[1]

	Collection,	Uitenhag.	Chal. A.	Chal. B.	E.U.A.M.	Umzimkulu. E.U.A.M.	Drift. E.U.A.M.	Drift. E.U.A.M.
	Age,	Aged.	Ad.	Ad.	Ad.	Ad.	Aged.	8 or 9
	Sex,	F.	M.	M.	M.	M.*	M.	F.?
	Cubic capacity,	1092	1135	1365	1420	1240	1435	...
	Glabello-occipital length,	170	177	177	186	182	182	174
	Ophryo-occipital „	170	176	175	183	180	182	174
	Basi-bregmatic height,	123	130	129	130	130	126	119
	Vertical Index,	*72*	*73*	*73*	*70*	*71*	*69*	*68*
	Minimum frontal diameter,	95	88	96	96	92	95	...
	Stephanic „	107	98	112	116	98	118	100
	Asterionic „	107	102	107	116	104	105	106
	Greatest breadth,	130*p*	132*s*	134*s*	141*s*	138*p*	139*p*	134*s*
	Cephalic Index,	*76·5*	*75*	*76*	*76*	*76*	*76*	*77*
	Horizontal circumference,	482	493	498	520	503	523	485
	Frontal longitudinal arc,	120	135	131	125	130	133	121
	Parietal „ „	125	115	105	148	124	132	123
	Occipital „ „	104	118	126	110	112	105	106
	Total „ „	349	368	362	383	366	370	350
	Vertical transverse arc,	272	294	293	300	288	300	286
	Length of foramen magnum,	35	33	39	36	32	36	37
	Basi-nasal length,	90	93	95	98	104	100	88
	Basi-alveolar length,	88	89	88	100	99	...	90
	Gnathic Index,	*97·7*	*96*	*93*	*102*	*95*	...	*102*
	Interzygomatic breadth,	119	118	119	...	125	126	114
	Intermalar „	110	108	110	...	116	114	100
	Ophryo-alveolar length,	75	77	82	81	78	...	69
	Naso-alveolar „	57	59	64	60	58	...	53
	Facial Index,	*63*	*65*	*69*	...	*62*	...	*60·5*
	Nasal height,	42	43	48	45	48	44	37
	Nasal width,	25	21	23	24	30	22	23
	Nasal Index,	*59·5*	*49*	*48*	*53*	*62·5*	*50*	*62*
	Orbital width,	36	38	37	37	38	36	32
	Orbital height,	30	31	31	28	29	32	30
	Orbital Index,	*83*	*82*	*84*	*76*	*76*	*89*	*94*
	Palato-maxillary length,	...	...	48	58	53	...	48
	Palato-maxillary breadth,	...	58	56	65	68	61	58
	Palato-maxillary Index,	...	...	*117*	*112*	*128*	...	*121*
Lower Jaw.	Symphysial height,	27	31	31	...	28	31	26
	Coronoid „	42	58	50	...	54	51	49
	Condyloid „	41	49	45	...	47	45	41
	Gonio-symphysial length,	83	86	85	...	89	90	79
	Inter-gonial width,	83	85	89	...	89	89	79
	Breadth of ascending ramus,	35	31	31	...	31	31	30·5

[1] In this and the succeeding tables Chal. signifies the Challenger Collection ; E. U. A. M., the Anatomical Museum of the University of Edinburgh. * With pelvis.

index was 81, and the range from 76 to 89 was 13; the orbits were microseme, with the exception of one which was mesoseme. The mean palato-maxillary index was 119, and the range from 112 to 128 was 16; the palato-alveolar region was therefore brachyuranic. The mean cubic capacity of the five adult male crania was 1319 c.c., the maximum 1435, the minimum 1135, the range being 300 cubic centimetres; the internal capacity of the adult female was only 1092 c.c.; in their average capacity the skulls were microcephalic, but three specimens were mesocephalic.

The skulls were therefore in their average proportions mesaticephalic, tapeinocephalic, cryptozygous, orthognathic, platyrhine, mesoseme brachyuranic and microcephalic.

Crania said to belong to the Bush race have been described, and in several instances figured, by Blumenbach,[1] Sandifort,[2] W. C. L. Martin,[3] Owen,[4] Williamson,[5] Van der Hoeven,[6] Vrolik,[7] Barnard Davis,[8] Fritsch,[9] Zuckerkandl,[10] Flower,[11] de Quatrefages with Hamy,[12] and Rolleston.[13] The precise localities in south Africa in which the Bush people lived, to whom the majority of these skulls belonged, have unfortunately not been stated; but the districts from which others, as well as some of those now described by myself, were obtained, are recorded. They have been procured from a wide geographical area, extending from Clanwilliam and Calvinia on the west, to the sources of the Umzimkulu and St. John's rivers on the east, and ranging northwards and eastwards through the Transvaal to the country between the Tati and Ramaquehan rivers in Matabele Land. The last-named locality, in lat. 20° 54′ long. 27° 42′, is the most northerly spot from which Bush skulls have as yet been obtained. These specimens were collected by the late Mr. Frank Oates,[14] and were described by the late Dr. Rolleston. But the range of these people is even greater than is implied in the above statement, as they probably form scattered hordes in the middle of the continent extending northwards to the 19th or 20th degree of latitude, and also reach the west coast in the district

[1] Decas quinta collectionis suæ Craniorum, p. 12, pl. xlv.

[2] Tabulæ Craniorum.

[3] Natural History of Man and Monkeys, p. 298, 1841.

[4] Catalogue of Osteological Series in Museum of Royal College of Surgeons, vol. ii. p. 832, 1853. Anatomy of Vertebrates, vol. ii. p. 564, 1866.

[5] Observations on Human Crania in Army Medical Museum, Chatham, *Dublin Quarterly Journal of Medical Science*, May and August, 1857, and as a separate reprint.

[6] Catalogus Craniorum diversarum gentium, Leyden, p. 58, 1860.

[7] Musée Vrolik, p. 55.

[8] Thesaurus Craniorum, p. 216, 1867.

[9] Die Eingeborenen Süd-Afrika's, p. 410, 1872. Also, Die afrikanischen Buschmänner als Urrasse, in *Zeitschr. für Ethnologie*, Bd. xii. p. 289, 1880.

[10] Reise der Novara, Anthropologischer Theil, pp. 55, 64, 1875.

[11] Catalogue of Osteological Specimens, pt. i., p. 246, 1879.

[12] Crania Ethnica, p. 389, 1882.

[13] Appendix to Matabele Land, by Mr. Frank Oates, p. 273, 1881, and reprinted in Rolleston's collected Scientific Papers and Addresses, edited by Prof. Turner, p. 462, Oxford, 1884.

[14] Matabele Land and the Victoria Falls, p. 231, London, 1881.

of Great Namaqua Land.[1] It is probable that before, and in the early days of, the European colonisation, tribes of Bushmen lived as far south as the Cape itself, so that one may agree with the following statement made by Dr. Fritsch[2] that throughout South Africa, from the Cape up to the Zambesi, and probably still further north, the territory of the Bush people had extended.

The skulls ascribed to the Bush race, including those described in this Report, which have now been examined by craniologists, are at least forty-six in number, and of these about two-thirds are apparently male skulls. A sufficient number has therefore been studied to enable one with some degree of certainty to state the characters of the Bush skull.

From a comparison of the several descriptions it is evident that in these crania the forehead approaches the vertical; the frontal and parietal eminences are as a rule prominent; the skull is flattened on the vertex; the glabella and supraciliary ridges are not strongly marked, although Fritsch regards them as more prominent than in the skull of the Hottentot; the nasal region is flattened, and the nasal bones enter into the profile outline of the face only by their lower ends, so that the Bush profile markedly contrasts with that of such skulls as the Fuegian drawn on Pl. I.; the malar bones project forwards; the nasal spine of the superior maxillæ is feeble; the skull generally is small.

The length and breadth of thirty-six crania have been recorded by Van der Hoeven, Vrolik, Barnard Davis, Fritsch, Zuckerkandl, Flower, de Quatrefages with Hamy, Rolleston, and myself. If we exclude one described by Zuckerkandl (No. 67), the cephalic index of which was 66·6, and another by Barnard Davis with a cephalic index 67 (No. 388, Thesaurus Craniorum), both of which from their extreme narrowness were probably either deformed skulls or not crania of the Bush race, the mean length-breadth index of the remaining thirty-five crania was 75·2, which places the skulls in the mesaticephalic division. Of these specimens twenty-three had a cephalic index of 75 or upwards, and the highest of these, a specimen described by Rolleston, being one of the males collected by Mr. Frank Oates, had an index of 81. The remaining twelve fell below 75, and the lowest of these were specimens described by Fritsch and Vrolik which had the cephalic indices respectively of 69·4 and 69·9.

On comparing my series of crania with the published figures of other specimens, there is obviously a difference in the amount of backward projection in the occipital region. This is especially to be noted in the skull originally described by Blumenbach, a profile view of which has recently been given by MM. de Quatrefages with Hamy (p. 391,

[1] Stieler's Hand-Atlas, Nos. 71, 72, Gotha, 1882.

[2] Die Eingeborenen, &c., p. 386. Fritsch gives the mean height of six Bushmen as 144·4 cm., and of five women as 144·8 cm., so that the women were 0·4 cm. taller than the men. This is similar to the experience of Dr. Louis Vincent who states (*Revue d'Anthropologie*, t. i. p. 453, 1872) that it is seldom that a Bush person exceeds 1·40 m. in height; that the mean height is 1·30 m., and that the women are a little taller than the men.

fig. 347). This skull has a cephalic index of 73·03, and is therefore distinctly dolichocephalic, its more elongated index being apparently due to its occipital projection. Dr. Williamson also, who does not, however, give any measurements, states that the occiput is well rounded and frequently prominent in Bush crania.

The height of thirty-two crania has been given by Barnard Davis, Fritsch, Flower, de Quatrefages with Hamy, Rolleston, and myself, and the mean vertical index of these specimens is 71, which precisely corresponds with the mean of my six adult crania. Seventeen of these crania had a vertical index of either 71 or less, and in one skull described by Prof. Rolleston the index was as low as 65; in another, from Mr. Oates's collection, described by the same anatomist, it reached as high as 78, but this was quite exceptional. The Bush crania, therefore, are decidedly tapeinocephalic. It is obviously a general character of the Bush skull that the vertical diameter is less than the greatest breadth.

In fifteen crania a gnathic index has been calculated by Flower, Rolleston, and myself, from a comparison of the basi-nasal with the basi-alveolar diameters. The mean index in these specimens was 97·9, which places the skulls in the orthognathic series. Several of the specimens were, however, above 98, which is taken as the upper limit of orthognathism, and three reached 102; so that individual skulls have a forward projection of the upper jaw considerably above the average of the race, but in no instance did they attain that degree of prognathism which is characteristic of the negro. The want of projection of the upper jaw in these people is also testified to by Dr. Williamson, who in his excellent description of the Bush crania in the Army Medical Museum states that "the alveolar processes are straight and broad in front, and do not project, but the position of the sockets causes the teeth to stand forwards."

The nasal index has been computed in twenty-one specimens by Flower, de Quatrefages with Hamy, Rolleston, and myself, and the mean index is 58·4, which places these skulls well into the platyrhine series. The mean of this large series of crania is, however, less than that obtained by either Flower, de Quatrefages with Hamy, or Rolleston, in their respective series, owing to the low mesorhine indices (48, 49, 50) in three of the specimens which I have recorded, and yet these mesorhine crania had in other respects well-marked Bush characters. The width of the nasal aperture is also specially referred to by both Williamson and Fritsch as a feature in the Bush skull.

The orbital index has been calculated in the same twenty-one specimens, and the average is 83, which places the skulls in the microseme series. A considerable range, however, prevailed in this index, for in a skull described by Dr. Rolleston it was as high as 100, and in another skull measured by the same anatomist it fell to 73.

The palato-maxillary index has as yet only been recorded in the skulls described in this Report; the mean of the measurements of four crania being 119·5, which places these skulls in the brachyuranic series.

The mean internal capacity of Prof. Flower's specimens was 1252, that of Dr. Rolleston's 1285, of my own 1281. All therefore are microcephalic.

As a result of the examination of the collective measurements of the extensive series of Bush crania which have now been recorded by craniologists, one may state that these skulls are on the average mesaticephalic, tapeinocephalic, orthognathic, platyrhine, microseme and microcephalic. This result corresponds therefore with that at which Flower, Rolleston, and myself had independently arrived from the examination by each of us respectively of the series of crania which had passed through our hands.

Dr. Rolleston has also directed attention to the form of the lower jaw as very characteristic of the Bush cranium. My specimens closely corresponded in the feebleness of the chin, the lowness of the coronoid process, the shallow sigmoid notch, and the everted angle with his description, but the hollowing out below the internal dental foramen to which he also refers was not specially noticeable. Further, I may point out another character which obviously deserves consideration, viz., the almost equality in length between the diameter from the angle of the jaw to the chin, and that between the opposite angles of the same bone. In each skull the basi-nasal and the basi-alveolar diameters exceeded the gonio-symphysial length, and similarly the intergonial diameter was always below the minimum frontal diameter in the same cranium.

Dr. Fritsch also lays considerable stress upon the breadth of the face, on that of the skull in the spheno-frontal region, and indeed on the breadth of the transverse measurements generally, in the Bush crania. In my description (p. 11) I have pointed out how the transverse diameter in the parietal region greatly dominated over the interzygomatic, so that the skulls were cryptozygous.

FUEGIAN AND PATAGONIAN.

Plates I., VI. Tables II., XVIII., XIX.

The crania marked Fuegian consisted of four adult specimens, only one of which possessed a lower jaw. This specimen was soldered up in a zinc case marked "Head of a Fuegian," but all the flesh had been removed and the brain was putrid; it is the skull D in the following description. One skull was marked Patagonian. All these crania were obtained at Puntas Arenas, in Magellan's Strait, and were presented as undoubted Fuegian skulls to Sir Wyville Thomson by Don Diego Dublé Almeida, the Governor of the Chilian colony. Two of the Fuegian crania were somewhat injured, but the other two and the skull marked Patagonian were in good condition.

Fuegian.—The Fuegian skulls are distinguished in the following description by the letters A to D inclusive. A and D were males, C was a female. B was more difficult to determine, but probably a female.

Norma verticalis.—These crania had no marked antero-posterior elongation. The line of the sagittal suture was elevated into only a slight ridge, except in A, in which, however, the region of the anterior fontanelle was flattened. Between the sagittal suture and the parietal eminences and temporal ridge the vault was somewhat flattened, and sloped downwards and outwards, so as to give what Prof. Cleland names an "ill-filled" character to this region of the skull. The eminences themselves were distinct, though not particularly prominent, and below them each skull bulged out slightly, so that the greatest breadth was in the squamous region. A and B were distinctly phænozygous, D slightly so, C not at all. In three of these skulls the asterionic diameter was slightly more than the stephanic in the same specimen. In the fourth the stephanic was 7 mm. more than the asterionic diameter.

Norma lateralis.—The skulls rested in front on the crowns of the upper molars, and behind on the cerebellar region of the occiput. In A and D the glabella and supraciliary ridges were distinct, but in B and C comparatively feeble. The profile outline formed a continuous curve from the glabella to about the obelion, but from that region the skull sloped downwards and backwards to the occipital point, and was somewhat flattened. In B this slope was more nearly vertical, but in none of the crania was there evidence of artificial parieto-occipital flattening. The occipital squama projected behind the protuberance, but in A a well-marked mesial depression existed between the protuberance and the superior angle. The frontal longitudinal arc in one case exceeded the parietal, the parietal and frontal arcs in one skull each exceeded the occipital, but in the others the occipital arc was the longest. The basi-nasal diameter in each specimen was longer than the basi-alveolar.

The nasal bones were elongated, and ranged from 26 to 31 mm.; their width varied from 11 to 15 mm. They projected downwards and forwards, and the bridge of the nose was prominent and concavo-convex from root to tip, and formed a marked feature in the facial aspect of these crania. The nasal spine of the superior maxillæ was strong in both A and D. The junction of the side walls with the floor of the anterior nares was not much rounded. In three of the crania there was a marked depression of the frontal bone, immediately above the external orbital process, which gave prominence to that part of the orbital border. This depression extended upwards and backwards in front of the temporal ridge, and, owing to the feebly developed frontal eminences, contributed to impart a slope to the forehead from the external orbital process and temporal ridge upwards and inwards towards the mesial line of the frontal. The temporal ridge in two of the crania was strong and in all divided into an upper and a lower part.

In each skull the interzygomatic diameter was much greater than either the stephanic or asterionic, and in every skull but C the intermalar diameter also exceeded the stephanic and asterionic. In two cases the interzygomatic diameter was slightly more than the greatest breadth in the parieto-squamous region, and in the other two it was decidedly

less. The inter-orbital width was either 21 or 22 mm. In D, the only one which had a lower jaw, the length of the face from the ophryon to the chin was 140 mm., and from the fronto-nasal suture to the chin 118 mm.

The teeth in all were fully erupted, though many of the sockets were empty. In A and B the crowns were much worn and flattened, but there was no decay.

The cranial sutures, except in C, were simple in their denticulations. In A and B they

TABLE II.—FUEGIAN AND PATAGONIAN.

		Fuegian. Chal.				Patagonian.
	Collection,	A.	D.	B.	C.	Chal.
	Age,	Ad.	Ad.	Ad.	Ad.	Ad.
	Sex,	M.	M.	F?	F.	M.
	Cubic capacity,	1390	1362	1190	1392	1290
	Glabello-occipital length,	182	186	175	182	182
	Ophryo-occipital „	179	183	175	182	181
	Basi-bregmatic height,	137	138	133	132	141
	Vertical Index,	*75*	*74*	*76*	*72·5*	*77*
	Minimum frontal diameter,	102	95	97	96	99
	Stephanic „	112	108	108	114	112
	Asterionic „	113	114	110	107	110
	Greatest breadth,	141*s*	136*s*	137*s*	142*s*	141*s*
	Cephalic Index,	*77·5*	*73*	*78*	*78*	*77·5*
	Horizontal circumference,	520	520	493	515	521
	Frontal longitudinal arc,	122	125	110	130	124
	Parietal „ „	123	115	119	...	110
	Occipital „ „	120	133	122	...	140
	Total „ „	365	373	351	372	374
	Vertical transverse arc,	302	300	282	308	297
	Length of foramen magnum,	38	36	32	35	35
	Basi-nasal length,	106	106	102	100	101
	Basi-alveolar length,	104	102	97	...	101
	Gnathic Index,	*98*	*96*	*95*	...	*100*
	Interzygomatic breadth,	143	130	139	130	144
	Intermalar „	127	117	123	112	125
	Ophryo-alveolar length,	90	100	93	...	101
	Naso-alveolar „	66	70	70	...	75
	Facial Index,	*63*	*77*	*67*	...	*70*
	Nasal height,	52	54	51	...	53
	Nasal width,	22	22	25	21	26
	Nasal Index,	*42*	*41*	*49*	...	*49*
	Orbital width,	39	39	38	38	39
	Orbital height,	34	36	36	37	38
	Orbital Index,	*87*	*92*	*95*	*97*	*97*
	Palato-maxillary length,	58	54	54	...	55
	Palato-maxillary breadth,	63	60	62	62	66
	Palato-maxillary Index,	*109*	*111*	*115*	...	*120*
Lower Jaw.	Symphysial height,	...	31	...	...	...
	Coronoid „	...	73	...	...	...
	Condyloid „	...	68	...	...	...
	Gonio-symphysial length,	...	99	...	...	...
	Inter-gonial width,	...	94	...	...	...
	Breadth of ascending ramus,	...	41	...	...	...

were in course of being ossified, and these skulls were of more advanced age. In C a well-marked triquetral bone formed the superior angle of the occipital squama, and a large Wormian bone was in the right pterion. In none did the temporal squama articulate with the frontal, or was the frontal suture persistent. In all the os planum of the ethmoid had a quadrilateral form. In none was the maxillo-premaxillary suture visible on the palatal surface. In all the hard palate was hollowed into a deep fossa where the posterior palatine foramen opened, and in three of the crania this fossa had a depth of 15 mm. opposite the second molar. The exoccipitals were tumid on the inferior surface, and in B slightly, but in D more definitely, projected downwards, so as to form a short paramastoid process.

The lower jaw of D was a well-developed bone, with a good chin. The angle was almost rectangular but not everted, and the teeth were all present. The gonio-symphysial length was somewhat greater than the intergonial width.

The mean cephalic index of the four crania was 76·6 : the maximum (female) was 78, the minimum (male) 73. The crania were therefore mesaticephalic, three being above its lowest term, but D was dolichocephalic. When D was omitted the mean cephalic index of the rest was 77·8. The mean vertical index was 74·4 : the maximum 76, the minimum 72·5, both females. The height was somewhat below the mean breadth ; only in D, a male, did the height exceed the breadth, and in the undoubted female skull the smaller relative height was well marked. In three cases the vertical index was less than the cephalic. The skulls were metriocephalic. The mean gnathic index was 96 : the maximum (male) 98, the minimum (female) 95. The face was therefore orthognathic. The mean facial index was 69 : the maximum (male) 77, the minimum (female) 63. The mean nasal index was 44 : the maximum (female) 49, the minimum (male) 41. The nose was therefore leptorhine, only one specimen slightly exceeding its highest term. The mean orbital index was 93 : the maximum (female) 97, the minimum (male) 87. All the skulls were megaseme, except one male, which was mesoseme. The mean palato-maxillary index was 111·5 : the maximum (female) 115, the minimum (male) 109 ; there was no great disproportion between the length and breadth of the palato-alveolar region ; the index of which was mesuranic. The mean capacity of the four crania was 1333·5 cubic centimètres ; that of the two presumable males was 1376 ; that of the two presumable females 1291 c.c. The two males were mesocephalic, whilst the average of the females, as well as that of the series of four skulls, was microcephalic.

These Fuegian crania were therefore on the average mesaticephalic, metriocephalic, tending to phænozygous, orthognathic, leptorhine, megaseme, mesuranic and microcephalic.

Patagonian.—The single skull marked Patagonian was an adult male. It corresponded in general form with the Fuegian A. It had the same cephalic index 77·5, and was therefore mesaticephalic. Its vertical index, greater than in A, and almost as high as its

cephalic index, was just akrocephalic. The stephanic diameter slightly exceeded the asterionic, but both were below either the interzygomatic or intermalar. The interzygomatic was slightly more than the greatest transverse diameter in the parieto-squamous region. The interorbital width was 24 mm. The frontal longitudinal arc was greater than the parietal, and both were considerably below the occipital. The basi-nasal and basi-alveolar length were equal, and the index was mesognathic. The skull was phænozygous. It was depressed in the frontal region above the external orbital process. The palatal fossa was 17 mm. deep opposite the second molar. The nasals were 30 mm. long, and the bridge of the nose was prominent and concavo-convex. The pterion was normal, and there were no Wormian bones. The skull rested behind on the cerebellar region of the occiput. In its capacity of 1290 c.c. it was microcephalic. In its facial characters and proportions it differed from A in the following:—the gnathic, facial, nasal, orbital, and palato-maxillary indices were all greater, but the facial, nasal, and orbital indices did not exceed the corresponding indices of others of the skulls marked Fuegian. It showed no sign of artificial deformity.

Very few Fuegian skulls have been examined by craniologists. The specimens contained in museums, and up to this time recorded, do not apparently exceed nine in number, and of these six are apparently males and three females. The authorities who have written on these crania are Professors Owen,[1] Huxley,[2] Flower,[3] and de Quatrefages with Hamy.[4] To this list are now to be added the four skulls described in this Report.

Prof. Owen's description is limited to a single male skull, which, together with a considerable part of the skeleton, is in the Museum of the Royal College of Surgeons of England (No. 5428, Old Cat.). The same skull is figured by Prof. Huxley, and a brief reference is also made by him to another cranium, probably that of a young woman, collected by Dr. R. O. Cunningham at Philip Bay. Prof. Flower gives the principal measurements (No. 1025, New Cat.) of the skull already described by Owen and figured by Huxley, as well as of two other crania from Fuegia (Nos. 1026, 1027), and since the catalogue was published two additional specimens have been presented to the College of Surgeons, the one, a male, found in a shell heap near Ooshooia, the measurements of which are recorded in manuscript in the museum copy of the catalogue (No. 1025, *a*),[5] the other of a young girl about 15 (No. 1027, *a*). MM. de Quatrefages and Hamy have recorded the measurements of two crania, one of which, from Desolation Land, they have figured in pl. lxxv. figs. 3 and 4.

The measurements and figures of such of the skulls as have been published show that

[1] Catalogue of Ost. Series in Mus. Roy. Col. Surgeons, vol. ii. p. 846, 1853.

[2] *Journal of Anatomy and Physiology*, vol. ii. p. 253, 1868.

[3] Cat. of Ost. Specimens, pt. 1, p. 179, 1879.

[4] Crania Ethnica, p. 478.

[5] Prof. Flower gives the cephalic index as 73·4, the vertical index as 71·9, the gnathic as 100·9, nasal 49·1, and orbital index 95·1. The skeleton was said to be that of a remarkably tall man.

they varied considerably in the relation of the length and breadth of the cranium. The two measured by MM. de Quatrefages and Hamy had a mean cephalic index 74·8, whilst those measured by Prof. Flower ranged from 73·4 to 81·8. Similarly the four skulls described by me in this Report varied considerably, the lowest D being 73, whilst the others were either 77·5 or 78. The skull which Prof. Huxley figured had a cephalic index 74, so that he draws the conclusion that the Fuegian skull is dolichocephalic, and with this conclusion MM. de Quatrefages and Hamy concur. But if we take the whole series of eleven skulls, including those published in this Report, the cephalic indices of which have been recorded, we shall find that only six were below 75 (the lowest being 73), whilst the mean of the series was 76·5. Hence, if 75 be regarded as marking the highest term of dolichocephalism, the average index places them in the mesaticephalic group, though somewhat more than one-half were dolichocephalic. Notwithstanding the high mesaticephalic index of three of the skulls which I have described, the parieto-occipital region in them had much more the shape to be seen in skulls of dolichocephalic than of brachycephalic proportions, and the parietal eminences were not set so far back on the side of the cranium as one sees in brachycephalic skulls. The specimen D which I have figured (Pl. I. figs. 5, 6) closely corresponded in its contour with the skull figured by Prof. Huxley and with that delineated by MM. de Quatrefages and Hamy.

To afford a convenient opportunity of making a comparison, I reproduce, from the Journal of Anatomy and Physiology, the four views of the Fuegian skull figured by Prof. Huxley.[1]

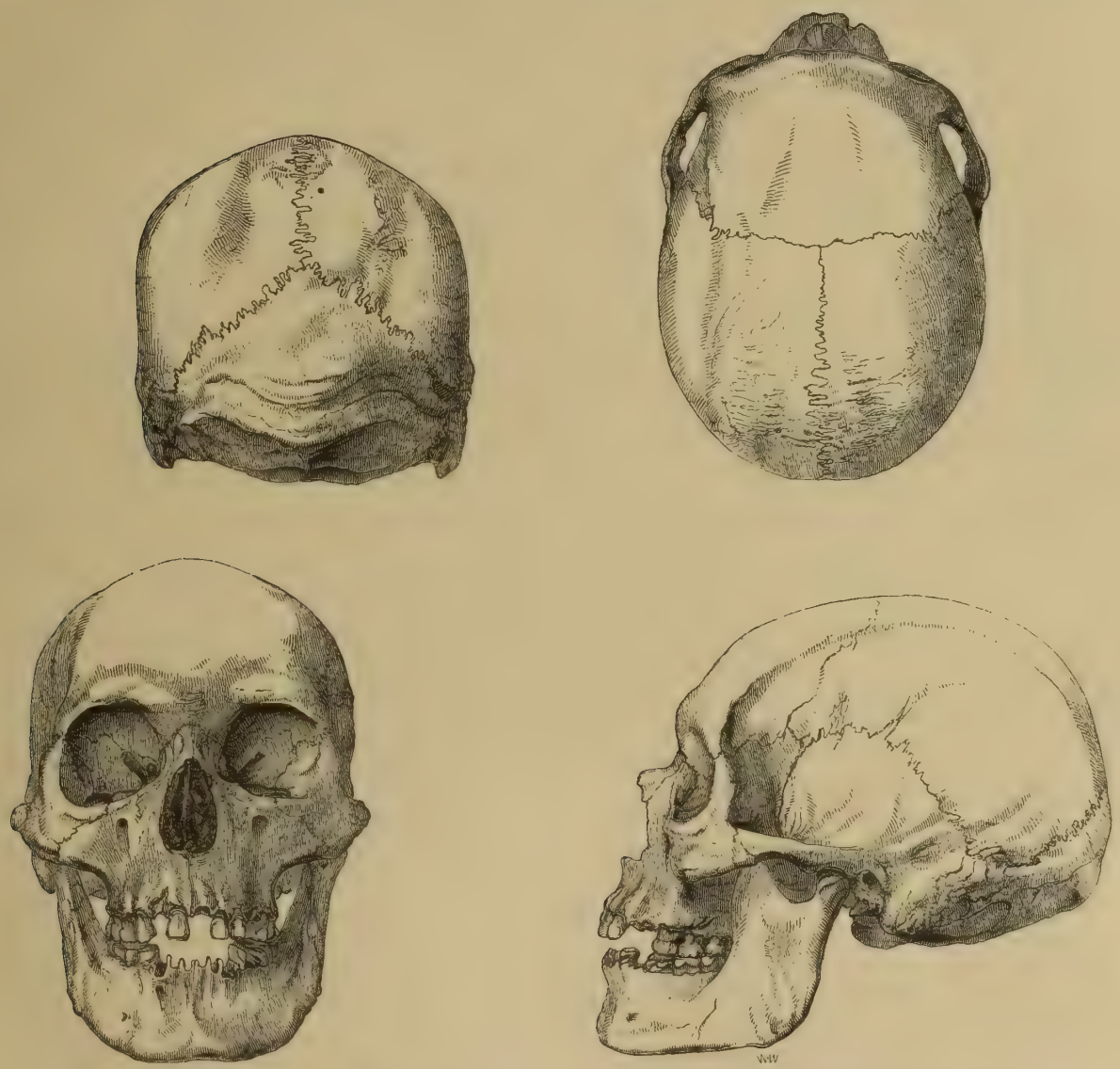
There can, I think, be no question that D is an authentic specimen of a Fuegian skull, not only from its resemblance to those above referred to, but because, from the attempt, unfortunately unsuccessful, to preserve the brain, the man must have died at Sandy Point, and was doubtless known to have been a Fuegian. My other specimens, although differing in their cephalic indices so much from the skull D, yet agree with it in many other of its characters, and are probably also the skulls of Fuegians who had died at Sandy Point, to which settlement some of the tribes of Tierra del Fuego are accustomed to resort for the purposes of barter.

The two skulls, said to be males, measured by MM. de Quatrefages and Hamy, had a mean vertical index of 76·4, *i.e.*, 1·6 higher than their mean cephalic index; hence these authorities state that the Fuegian skull is hypsistenocephalic. In one of the eight skulls, the heights of which have been given by Prof. Flower and myself, the vertical index was greater than the cephalic (D. in my Table II.), and in the male skull figured by Mr. Huxley the vertical and cephalic indices were equal (73·9), but in the remaining six, three of which are presumably males, the vertical index was decidedly less than the cephalic; the mean of the series of ten crania was 73·87; hence they are metriocephalic.

[1] I may state that these views of the Fuegian skull have also been reproduced by MM. de Quatrefages and Hamy in the Crania Ethnica, p. 477, figs. 434–437.

The mean of the seven males was 73·4; of the three females 74·8, so that their vertical index was higher than the males, which is exceptional to the general rule in the two sexes.

The nasal and orbital indices have been determined in the skulls examined by MM. de



Figs. 1, 2, 3, 4. Occipital, vertical, facial, and lateral, aspects of Fuegian skull in Mus. Roy. Col. Surgeons, London, No. 1025.

Quatrefages and Hamy, Prof. Flower, and myself. The mean nasal index in eight crania was 44·68, the minimum 41, the maximum 49·1, so that the average of this larger number was almost the same as in my smaller series, and confirms the leptorhine character of the nose of these people. The mean orbital index in nine crania was 91·1, the

minimum 84·2, the maximum 97 ; so that the megaseme character of the orbit is obviously the rule, although three specimens had mesoseme proportions.

The gnathic index has been determined in six specimens by Prof. Flower and myself. Owing to the higher index in the College of Surgeons specimens (ranging from 100·9 to 105·9) than in those collected by the Challenger, the mean of the entire series was 99·76, which places them in the mesognathic division, though, as the range was from 95 in a female skull to 105·9 in a male, individual skulls were either orthognathic, mesognathic, or prognathic.

The internal capacity has been taken in seven specimens by Prof. Flower and myself. The mean contents of the brain case were 1309 cubic centimètres, which places them in the microcephalic series, and the range was from 1190 in the skull B, which I have regarded as probably a female, to the male skull figured by Prof. Huxley, the capacity of which was 1420 c.c.

From the above analysis one may summarise the general characters of the Fuegian skulls as follows :—mesaticephalic, metriocephalic, mesognathic, leptorhine, megaseme, and microcephalic. This analysis of the whole series of skulls to the records of which I have had access agrees, except in the degree of projection of the upper jaw, with the results I had arrived at from the examination of the four specimens described in this Report.

During the years 1881 and 1882, a party of Fuegians, consisting of four men, four women, and three young children visited Europe, and were examined by numerous anthropologists in Paris, Germany and Switzerland.[1] They appear to have belonged to the Alaculoof tribe, and according to the Rev. Thos. Bridges[2] were not from Hermite Island, in immediate proximity to Cape Horn, as is stated by M. Topinard and by Prof. Virchow, but from Dawson Island to the north-west of Admiralty Sound. Measurements of the body, of the head and face are given independently by M. Manouvrier and by Prof. Virchow. The mean length of the head in the four men is stated by M. Manouvrier to be 196·7 ; that of the four women 193·2 ; the mean breadth is given as 157·2 in the men and 155 in the women ; the cephalic index of the males is 79·9,

[1] A most interesting account of these people, as observed during September 1881, was given by M. L. Manouvrier, M. Topinard, and other French anthropologists, to the Société d'Anthropologie de Paris (*Bulletins*, Nov. 17, and Dec. 15, 1881, ser. 3, vol. iv. pp. 760, 841) ; also by Prof. Virchow to the Berliner Gesellschaft für Anthropologie, Nov. 14, 1881 (*Zeitschrift für Ethnologie*, Bd. xiii. 1881, p. 375). Prof. Bischoff has also written a short brochure on their physical and psychical characters, entitled "Die Feurländer in Europa," Bonn, 1882, and he has also communicated to *Sitzungsb. d. K. B. Akad. der Wiss.*, Feb. 4, May 6, 1882, two papers on the female genital organs and functions. In *Virchow's Archiv*, Bd. xci. p. 154 and p. 446, 1883, Dr. J. Seitz of Zurich describes the illness and death of five members of the troop, and gives an account of the *post mortem* appearances ; he also contributes some observations on their habits and character. The Rev. Thos. Bridges states that only four returned to Fuegia, a youth, a middle-aged woman, and two children (see reference in next footnote). Dr. Seggel gave an account to the Anthropologische Gesellschaft of Munich of the eyes of the Fuegians (*Archiv für Anthropologie*, Bd. xiv. 349, 1883). In February 1884 Dr. Hyades, a member of the French Scientific Mission to Cape Horn, contributed to the *Bull. de la Société d'Anthropologie*, some observations on the Tekeenika tribe, more especially on their language, and as a supplement to his paper he translates one on their manners and customs by the Rev. T. Bridges.

[2] *South American Missionary Magazine*, Nov. 1, p. 254, 1882.

that of the females 80·2. Virchow from his measurements places the cephalic index in the men at 79, whilst that of the two women whom he examined is in the one case 79·6, in the other 80·6, with a mean of 80·1; the mean of the series of six heads was 79·4. Both these observers therefore agree in placing the mean cephalic index of these Fuegian heads in the highest term of mesaticephalism, or the lowest of brachycephalism, which is somewhat higher than the mean of 76·5 deduced from the eleven crania which have up to this time been examined. One can no longer therefore say that the Fuegians are as a whole a dolichocephalic race. The mean stature of the four men is stated by M. Manouvrier to be $1^{m}{\cdot}612$, *i.e.*, 5 feet $3\frac{1}{2}$ inches, whilst Virchow gives 1645 mm., *i.e.*, 5 feet $4\frac{3}{4}$ inches as the height of Hendrich the tallest of the men.

The question however arises, may there not be more than one race of people dwelling in the islands of the Fuegian archipelago? Herr von Böhr, who sailed in Magellans Strait in 1879,[1] examined the heads of some men who visited his ship in their canoe about 20 nautical miles west of Cape Froward. He states that the skull was elongated, conspicuously high, and tapering off from the sides towards the vertex in a ridge. He took the greatest breadth and length, "mit einem etwas groben Tasterzirkel," and gives the cephalic index of three men as respectively 70, 73, and 77, or a mean of 73·3. Although he admits that his callipers were somewhat coarse, yet his eye had recognised the longish or oblong form of the head in these persons, so that although his measurements may not have been absolutely correct, yet they are probably approximately so. These observations, together with the measurements of certain of the skulls referred to on p. 22, point to the presence of people with dolichocephalic heads amongst the Fuegians. The tallest of the men was 5 ft. 1 in., the shortest 4 ft. 10 in. The proximity of the archipelago to the part of the continent occupied by the brachycephalic Patagonians may perhaps have led to an intermixture of races, so that if, as is not impossible, the original stock of these islands was dolichocephalic, a measure of fusion of the two races may have led to the origin of a people whose heads have mesaticephalic proportions, more or less strongly pronounced according to the proportion in which one or other of the two original races preponderated.

That the inhabitants of Tierra del Fuego are not a homogeneous people has indeed been recognised by more than one traveller. Captain Fitzroy states[2] that the Yacanakunny in the north-east of the large island resemble the Patagonians in colour, stature, and clothing, whilst the Tekeenica, who live in the south-east, are low in stature, ill-looking, and badly proportioned. The Alikhoolip tribe are not unlike, though superior to, the Tekeenica, whilst the Yacanas partake of the peculiarities of both the Patagonians and Fuegians. Captain King also describes the wife of a Fuegian as from her size not

[1] Communication made to the Berliner Gesellschaft für Anthropologie, Jan. 15, 1881 (*Zeitschrift für Ethnologie*, Bd. xiii. p. 30, 1881). Dr. Essendorfer had also, on 30th March 1880, given (*Zeitschrift*, Bd. xii. p. 57) some information about the aspect of the Fuegians, but without any measurements.

[2] Voyage of the Adventure and Beagle, vol. ii. p. 137, 1839. Captain King's description is in vol. i. p. 55.

unlike a Patagonian. Mr. Darwin says[1] that the people of the Bay of Good Success "are a very different race from the stunted miserable wretches farther westward, and they seem closely allied to the famous Patagonians of the Straits of Magellan" (p. 205). And conversely amongst the Patagonians at Cape Gregory, he observed a man with his face painted in white rings and dots like a Fuegian (p. 232). Dr. R. O. Cunningham also observed[2] that the people of the northern part of the large eastern island, the Yacana-kunny, differed strikingly from the western tribes in their much larger stature and in their manner of life, which approached in some particulars to that of the Patagonians. He further expressed the opinion that the southern Fuegian tribes had at a distant period migrated southwards "in consequence of having been evicted from their original territory by more powerful aboriginal nations." The Rev. Thos. Bridges, so well known for his philanthropic and missionary labours amongst the Fuegians, states that the Yahgan people at Ooshooia, where the mission station is, are short of stature, and with short and small arms and legs, the average height of the men being 5 ft. $3\frac{1}{2}$ in., and the women $2\frac{1}{2}$ in. shorter. On the other hand, the Ona tribe at Sloggett Bay are very muscular and well grown people, and of the same stock as the southern Patagonians.[3] The language spoken by each of the tribes of the Yahgans, Onas, and Alaculoofs is also quite distinct, so that one tribe cannot understand another.

I should also state that a collection of Patagonian crania, obtained by M. F. P. Moreno[4] along with numerous flint and other stone implements from ancient cemeteries of the Téhuelches in the valley of the Rio Negro—cemeteries, the exact age of which could not be ascertained, but which from the absence of the bones of the horse in them were probably formed before the introduction of that animal into Patagonia—displayed variations in the relations of length and breadth, though the majority were distinctly dolichocephalic. M. Moreno gives the measurements of forty-five crania, eighteen of which were artificially deformed and twenty-seven without deformity. Of the normal crania eleven were males and sixteen females. The mean cephalic index of the males he places at 75·0; that of the females at 74·15, whilst the mean of the entire series is 74·44. From the table of extreme lengths and breadths I have calculated the cephalic indices in the twenty-seven normal crania, and find that no fewer than sixteen have a cephalic index below 75, and of these four are below 70, the lowest being 67;[5] seven range from 75 to 78·6, and four only are distinctly brachy-

[1] Naturalist's Voyage, ed. 1870.

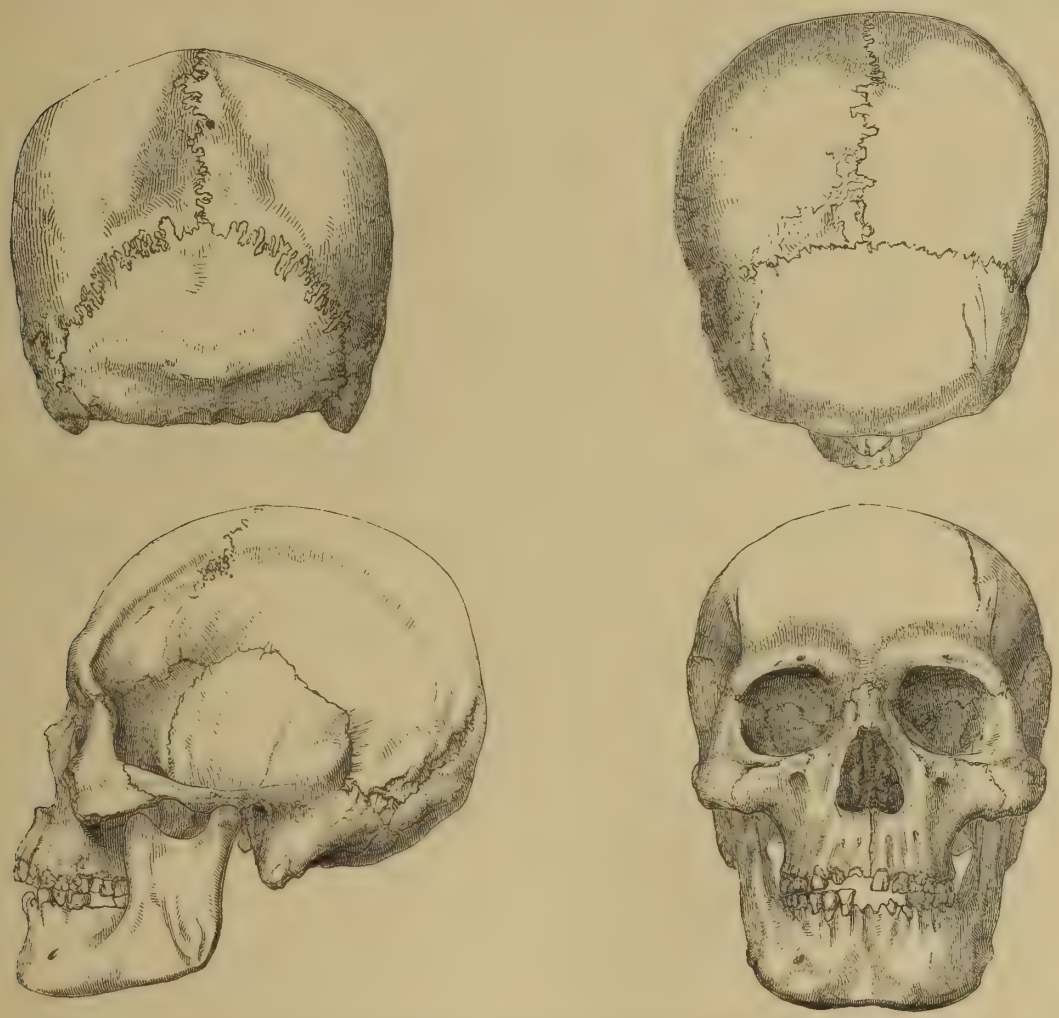
[2] Natural History of Straits of Magellan, 1871.

[3] *South American Missionary Magazine*, Jan. 2 and Oct. 2, 1882.

[4] Description des Cimetières et Paraderos préhistoriques de Patagonie, *Revue d'Anthropologie*, t. iii. p. 72, 1874. Lieutenant Masters has given an interesting account of the customs and physical appearance of the Races of Patagonia, especially of the Téhuelches, in the *Journ. of the Anth. Inst.* vol. i. p. 193, 1872.

[5] One of these skulls has its norma verticalis figured by MM. de Quatrefages and Hamy in the Crania Ethnica, p. 475, fig. 432—the norma facialis and norma lateralis in pl. lxxv. figs. 1 and 2.

cephalic, from 81·1 to 87·9. Prof. Virchow has also described[1] four skulls sent by Dr. Burmeister from the north side of the Rio Negro, two of which were deformed and two normal. Of the latter, one had a cephalic index of 77·4, the other of 70·3; the mean of the two being 73·85, which is almost the same as the much larger series collected by M. Moreno. Hence, it is clear that before the European colonisation of



FIGS. 5, 6, 7, 8.—Occipital, vertical, lateral, and facial aspects of Patagonian Skull from near the river Chupa.

South America a people with dolichocephalic heads inhabited that part of the continent which we now call Patagonia.

The single skull marked Patagonian brought home by the Challenger does not afford me sufficient material upon which to base any conclusion as to the cranial characters of the modern Patagonians. It is indeed open to some doubt if this be a genuine Patagonian, as in its general form and in some of its measurements it so closely resembled the Fuegian

[1] Communication made to Berliner Gesellschaft für Anthropologie (*Zeitschrift für Ethnologie*, Bd. vi. p. 51, 1874).

skull A. Its cephalic index is only 77·5, which is considerably below the mean of 85·3 of the seven Patagonian skulls (three females, four males) measured by Prof. Flower, in the Museum of the Royal College of Surgeons, two of which, however, are artificially deformed. It is also much below the skull of a Patagonian found in a tumulus near the river Chupa, cephalic index 89, figured by Prof. Huxley, whose figures for convenience of reference I have reproduced on p. 27,[1] and to the skull from Carmen, at the mouth of the Rio Negro, recently described by Mr. G. W. Bloxam,[2] the cephalic index of which was 92·6, in which, however, the index is without doubt increased by modification in the shape from occipital pressure. MM. de Quatrefages and Hamy also point out that the Puelches, the people who now occupy the valley of the Rio Negro, where the dolichocephalic race of the Téhuelches once resided, are remarkable for their brachycephalism. It may therefore be a fair subject for enquiry whether a dolichocephalic race did not precede in South America its present brachycephalic inhabitants, which race has been gradually displaced, though its descendants may yet be found in the Guaranis of Bahia[3] and in the Botocudos of Brazil, or pushed far to the southward in the dolichocephalic or, perhaps with some intermixture, also in the mesaticephalic people of the Fuegian archipelago. The difference between the modern Patagonian and the Fuegian is not one of head-form only. They differ also strikingly in their stature and mode of life, and the former in physical characteristics certainly, and probably also in intellectual, is obviously a much superior race to the latter.

AUSTRALIAN.

Plates II., VII. Tables III., IV., V., VI., XVIII., XIX.

Only three aboriginal Australian skulls were collected by the Challenger. One a male, probably from Queensland. A second, a male from Queensland, was obtained along with other bones of the skeleton from a collector. The third, a female from West Victoria, in the Camperdown district, inland from Port Fairy, was presented along with other bones of the skeleton by James Dawson, Esq.[4] In addition I have examined two skulls long in the Anatomical Museum of the University, and a considerable number of crania which I have been engaged for some years in collecting, and for which I am indebted partly to the kindness of W. G. Howitt, Esq. of Melbourne, and partly to that of several of my

[1] *Journal of Anatomy and Physiology*, vol. ii. p. 253. These figures have also been reproduced by Dr. Barnard Davis in his Supplement to the Thesaurus Craniorum, pp. 58, 59, 1875 ; and by MM. de Quatrefages and Hamy in Crania Ethnica, p. 468.

[2] *Journ. Anthrop. Inst.*, p. 28, Aug. 1882. Length 163 mm., Breadth 151 mm., Height 148 mm.

[3] Retzius in *Müller's Archiv*, 1849, and Ethnologische Schriften, p. 112, shows that the Guarani Indians are dolichocephalic. In the same *Archiv*, 1855, and in Ethnologische Schriften, p. 134, he gives the length and breadth measurements of the skull of a Pampas Indian, with a cephalic index of 88·4.

[4] A most interesting account of the customs, language, &c. of the natives of this part of Victoria has been given by Mr. Dawson in a quarto volume, Australian Aborigines, Melbourne, 1881.

pupils, of whom, from the number of specimens given to me, I may especially name Dr. Frederick Page, and Dr. G. More Reid.

The entire series consisted therefore of thirty-five crania, almost all of which were entire, and a large number possessed the lower jaw. They were from Queensland, New South Wales, Gipps Land, Victoria, South Australia, Lake Alexandrina, Alexandra Land, West Australia, North-West Australia, as far as the de Grey River, and Roebuck Bay.[1] They embrace specimens both of the coast tribes and of tribes much more inland.

With four exceptions they had all reached adult life, whilst some were more advanced in years; the four younger skulls ranged apparently from 16 to 18 years. Of the thirty-one adults twenty were apparently males and eleven females, whilst two of the four youths were males, the others probably females. In the male youths the basi-cranial synchondrosis was unossified. The 1st and 2nd permanent molars were erupted, but the wisdom teeth were still enclosed in their bony alveoli. It is remarkable that in one skull the upper lateral incisors were absent, apparently indeed never developed, and the canine sockets were in close proximity to the sockets for the central incisors. In the young

[1] The skull from Perth, West Australia, was dug up by John Thomson, Esq., Surgeon, along with the bones of the skeleton. The body was buried in the sitting posture, and the knees were the parts first exposed. The skull from the Macquarrie River district was found by Mr. D. Houison, 6 feet below the surface of a large mound of earth. The body, probably that of a chief, had been encased in Eucalyptus leaves 3 or 4 inches thick, and a layer of timber and bark was above the leaves. The trees facing the mound were marked and carved. The skull from Lake Alexandrina was got by Mr. Walter Dickson at the foot of a shea-oak tree, about 80 miles south of Adelaide and about 20 miles from the sea coast. In this district the natives smoke the bodies of their dead; they then swathe them in mats, bending the legs under the body, after which they place them in the forks of the shea-oak trees; as decomposition advances the bones fall to the ground. The Roebuck Bay skull, lat. 18°, was presented to me by Dr. F. Page, who states that the dead are left uncared for on the ground, but that the natives are more intelligent than those of the south-west coast; they make fishing lines and baskets, have heavy clubs and spears, which they do not throw, and have canoes in common use. They wear no clothing, are decidedly black, and are fine well-nourished men averaging 6 feet in height. Fish is their chief food. The Malays occasionally visit them. The Riverina skull, presented along with the skeleton by Dr. G. More Reid, was that of the chief of his tribe: he was said to be about 5 feet 10 inches high. The Coorong skull was obtained by Mr. Clement L. Wragge from a platform or funeral pile in thick tea-tree scrub adjoining the Coorong and mouth of the Murray; the body was rolled in coarse sacks. The Mudgee skull was dug up by Mr. R. Vandeleur Kelly near the banks of the Cudgegong River, New South Wales. The Mudgee tribe bury their dead in a large grave 3 or 4 feet deep, and make a circular mound over the grave, sometimes 10 feet in diameter; the corpse is placed in a sitting posture, with spears, boomerangs, &c., beside it. It is a custom of this tribe to knock out a front tooth, when a boy arrives at puberty. The skull from Eucla was that of a man said to be from 55 to 60, presented by Wm. Williams, Esq. (who also gave the male skull from Fowler's Bay, said to be a man of 40). The skull from the Wannon River was obtained by Mr. Pillean about 10 miles from Portland Bay and about 200 miles west of Melbourne. The Portland Bay skulls were dug up at the Hummocks, near Belfast and Warnamboot. The skull from the Margaret River, near Cape Leeuwin, says Dr. F. Page, was that of a man who had been a herdsman, and who stood 6 feet high, considerably above the average height of the men of his tribe, who are small, badly fed savages, dressed in skins and leading nomadic lives. Food is scarce with them. They live upon roots, with an occasional gorge of Kangaroo. Although close to the sea they do not fish with a net or line, nor do they make or use canoes. The natives of this district are of a mahogany colour, with long black hair and dark brown eyes. They bury the dead in the sitting posture and raise a tumulus over the grave. The Benalla skulls are from a place between the Goulburn and Murray Rivers, about 150 miles north of Melbourne; the male is said by Mr. James Grice, who dug them up, to be about 60, the female about 24. The specimen from the de Grey River was in the collection of the late Dr. Handyside, but has now been acquired for the Anatomical Museum of the University of Edinburgh.

females the basi-cranial synchondrosis was also unossified, the 1st and 2nd permanent molars were erupted, but the wisdom teeth had not come to the surface. In one of these a unicuspidate tooth occupied a cavity in the palatal plate of the left superior maxilla, behind the incisive canal and parallel and close to the intermaxillary suture. It lay horizontally, parallel to that suture, and with what seemed to be its crown directed backwards. The incisors, canines, bicuspids, and 1st and 2nd molars had all erupted in their proper order, so that this palatal tooth was a supernumerary *dens*.

It might seem scarcely necessary that I should enter into a minute description of the characters of the crania of the aboriginal Australians, as so much has been written on that subject by preceding craniologists; but as these skulls have been collected from so wide an area, and as the precise locality of collection has in most cases been noted, an examination and comparison of their most important features may not be considered to be out of place in this Report.

Norma verticalis.—In most of the skulls, especially the males, the ridge-like elevation in the sagittal region and the slope on each side outwards and downwards to the parietal eminence gave to the cranial vault a characteristic roof-like or ill-filled appearance; which was heightened by the ridge being not unfrequently prolonged forwards in the mid-frontal region. The greatest transverse diameter of the cranial box, both in the males and females, was in the great majority in the region of the squamous suture, and not near the parietal eminences. All the male crania were phænozygous, some slightly so, but others with widely arching zygomata. The females, with two exceptions, were phænozygous. In the youth's crania the zygomata were either invisible or barely visible in the norma verticalis. In the males the stephanic and asterionic diameters were equal or almost equal (within 2 mm.) in eight specimens. The stephanic exceeded the asterionic by more than 2 mm. in six, but was less than the asterionic in the remaining six. In the females the stephanic and asterionic diameters were equal or almost equal (within 2 mm.) in five specimens; the stephanic exceeded the asterionic in three, but was less than the asterionic in the remaining three. In the youth's crania the stephanic exceeded the asterionic by from 1 to 12 mm.

Norma lateralis.—Three of the males rested behind on the tips of the mastoids, one on the occipital condyles, the rest on the conceptacula cerebelli. The females all rested on the conceptacula, and one also on the condyles. The youths' all rested on the conceptacula. In the greater number of this series of skulls, therefore, the cerebellar region of the occipital bone bulged downwards. In the Portland Bay specimens it was almost horizontal, and the inion was brought low down in the occiput. The crania were all elongated. In all the male skulls, with one exception, both the frontal and parietal longitudinal arcs were considerably greater than the occipital; in the exceptional cranium, from Swan Hill, whilst the frontal arc was longer, the parietal was less than the occipital.

In five specimens the frontal and parietal longitudinal arcs were either equal or within 2 mm. of each other; in eight the frontal was in excess, often much greater, than the parietal; in seven the frontal was less, sometimes much less, than the parietal. In all the female skulls, with one exception, the frontal and parietal longitudinal arcs were greater than the occipital; in the exceptional cranium, from New South Wales, whilst the frontal was longer, the parietal was less than the occipital. In three specimens these two arcs were within 2 mm. of each other; in four the frontal arc exceeded the parietal; in four the parietal exceeded the frontal. In all the youths' skulls the occipital arc was less than either the frontal or parietal; in two the frontal was longer than the parietal; in two the parietal was longer than the frontal.

The male crania were, as a rule, massive and heavy, and with strong eminences and ridges at the glabella, supraciliary ridges, external orbital processes, temporal and occipital curved lines. The male skull from the Riverina weighed, with its lower jaw, 2 lbs. $6\frac{3}{4}$ oz. avoir., and other skulls weighed 2 lbs. and 1 lb. $15\frac{1}{2}$ oz. The adpressed character of the frontal bone above the ectorbitals, in such skulls as those from the Riverina, Eucla, Wannon River, a Queensland and a Murray River skull, was so striking, that in this character and in the projecting glabella they approximated to the well-known skull from the Neander Valley. The very prominent glabella in these specimens contributed materially to the great length, 200 mm., which some of them possessed. On the other hand, the mastoids were not so massive, nor had they such a downward projection as one finds in the male crania of some other races, so that it was the exception for a skull to rest behind on the tips of the mastoids. The projection of the glabella caused a marked depression at the fronto-nasal suture. In the female and young skulls the glabella had so little prominence that the glabello-occipital and ophryo-occipital diameters were either equal or differed but slightly from each other; whereas, in the male skulls they sometimes differed by as much as 4, 5, or even 6 mm. The nasal bones sloped forwards and upwards, were frequently small in size, and the bridge of the nose was concave forwards, usually low, rounded from side to side, and not elevated into a crest. The dimensions of the nasal bones were not taken in all the specimens, but in those that were measured they varied from 18 to 26 mm. in length, and from 6 to 10 mm. in greatest breadth. A very marked slope of the frontal bone upwards and backwards from the glabella was present in many of the male crania. In the female skulls the frontal region was much less sloping, the fronto-orbital region was much smoother and the fronto-nasal less depressed. In a few specimens, *e.g.*, the Wannon river and Eucla crania, the temporal fossa extended so far up the side of the skull that the highest part of the temporal ridge reached to between 3 and 4 cm. from the sagittal suture, and the temporal ridge itself was usually double.

In none of the crania was the nasal spine of the superior maxilla prominent; as a rule, indeed, it was feeble in both the male and female crania. The sides of the anterior nares,

instead of being almost perpendicular to the floor of the nose, and with a sharp edge, were rounded off and smooth where they became continuous with the nasal floor. This form of the anterior nares was especially marked in the skull from Roebuck Bay, in which also the nasal spine of the superior maxillæ was reduced to a faint tubercle. As the obliquity of the sockets of the incisor teeth was great in this skull, the length of the palate and the alveolar prognathism formed marked features in the facial aspect, and the rounded floor and sides of the anterior nares approximated in appearance to the nares of an anthropoid ape. In all the adult skulls, with four exceptions, the width of the posterior nares, measured immediately above the root of the hamular process of the internal pterygoid plate, was less than that of the anterior nares. The interzygomatic breadth invariably exceeded the stephanic, asterionic, and intermalar diameters. Except in one female, the intermalar diameter was greater than the stephanic. In thirteen out of eighteen adult male skulls the interzygomatic diameter exceeded the greatest parieto-squamous; whilst in five out of seven female skulls the inter-parietal exceeded the interzygomatic. The mean interorbital breadth in the males was 24·5 mm., the maximum 28 mm., the minimum 21 mm., whilst in the females the mean was 22 mm., the maximum 25 mm., the minimum 19 mm.

The orbits in the males were characterised both by the massiveness of the upper orbital border and by a peculiar breadth and curvature of the malar bone where it formed the outer boundary, which wanted the sharpness one sees in crania generally, so that in taking the transverse diameter of the orbit there was a difficulty in deciding on the exact point on which the callipers should be placed. In many male skulls the canine fossæ were remarkably deep, although the teeth were not shed, and the hollow was not due to absorption of the jaws from age. These hollows, conjoined with the boss-like supra-orbital and supra-nasal projections, and a sort of general undulatory outline of the orbital boundary, gave to the facial aspect a peculiar rugged and irregular appearance. In the female skulls the external orbital border showed little trace of the peculiarity above described, and the canine fossæ had no special depth.

The crowns of the teeth were large, and the incisors and canines approximated in size; when the cusps were not worn away, the molars were coarsely tuberculated. As a rule the grinding surface of the crowns was flattened from wear, and the dentine more or less exposed. A few teeth were affected with caries, and occasionally a tooth had been shed from age, and the socket absorbed. In a male skull from Queensland, in the Mudgee skull, and in one from the Murray, New South Wales, the left central incisor had been extracted in early life, and its socket absorbed; in a West Australian from Perth, the right central incisor had been similarly treated.[1] This practice of extracting

[1] In some of the skulls subsequently referred to on p. 46 of text a similar peculiarity was observed, viz. in a skull from Rockhampton the right central incisor, in another from the same locality, the left central incisor, and in a skull marked "New Hollander" the right central incisor had been removed.

a central incisor prevails therefore in tribes widely separated from each other, but is by no means general amongst the natives, as none of the other skulls showed it. In the skull from Port Curtis the left lateral incisor had apparently not been developed. In a female from Gipps Land a rudimentary tooth with two small cusps protruded in the dentary arcade behind the left upper wisdom tooth. In a female from Victoria the first premolar was crowded out of its place, and in front of the canine. The palatal tooth in a youth's skull has already been described, p. 30. In many of the crania the maxillary tuberosity had grown into a roughened mass which prolonged the dentary arcade from 1 to 1½ cm. behind the last molar tooth.

In almost all the crania, except those of the youths, there was a tendency to oblitera-

TABLE III.—AUSTRALIAN—MALES.

	Collection,	Chal. Queensland.*	Chal. Queensland.	Port Curtis, Queensland.	Riverina,* N.S.W.	Mudgee tribe, N.S.W.	Macquarrie River, N.S.W.	Swan Hill *b.* N.S.W.	Swan Hill *a.* N.S.W.	Wannon River, Victoria.	Portland Bay, Victoria.
	Age,	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Aged.
	Sex,	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.
	Cubic capacity,	1360	1283	1514	1297	1132	1210	1365	1318	1192	1250
	Glabello-occipital length,	189	193	198	200	182	187	190	184	192	200
	Ophryo-occipital ,,	186	190	196	195	180	185	189	181	186	198
	Basi-bregmatic height,	132	135	136	146	135	135	144	134	134	132
	Vertical Index,	*70*	*70*	*69*	*73*	*74*	*72*	*76*	*73*	*70*	*66*
	Minimum frontal diameter,	92	100	108	100	93	90	99	92	90	98
	Stephanic ,,	105	106	120	108	104	108	110	108	104	109
	Asterionic ,,	116	116	115	106	103	110	106	110	105	109
	Greatest breadth,	132*s*	134*s*	136*s*	132*s*	129*s*	129*s*	135*s*	134*s*	124*s*	123*s*
	Cephalic Index,	*70*	*69*	*69*	*66*	*70·5*	*69*	*71*	*73*	*65*	*61·5*
	Horizontal circumference,	540	540	547	545	511	521	532	520	508	540
	Frontal longitudinal arc,	132	143	135	150	133	132	138	123	137	135
	Parietal ,, ,,	141	137	148	140	124	131	116	130	128	130
	Occipital ,, ,,	105	121	111	120	113	110	125	114	105	114
	Total ,, ,,	378	400	394	410	370	373	379	367	370	379
	Vertical transverse arc,	300	304	307	301	282	288	302	290	277	275
	Length of foramen magnum,	35	31	35	31	33	34	37	35	37	37
	Basi-nasal length,	108	97	106	110	100	104	108	104	107	113
	Basi-alveolar length,	107	100	103	114	100	102	104	109	108	117
	Gnathic Index,	*99*	*103*	*97*	*103*	*100*	*98*	*96*	*105*	*101*	*103·5*
	Interzygomatic breadth,	134	130	136	149	134	134	137	144	138	...
	Intermalar ,,	122	122	122	135	124	120	122	123	124	120
	Ophryo-alveolar length,	95	84	90	96	88	87	87	83	92	85
	Naso-alveolar ,,	73	62	68	70	64	64	66	63	66	65
	Facial Index,	*70*	*64*	*66*	*64*	*65*	*65*	*63*	*58*	*66*	...
	Nasal height,	50	43	50	47	48	51	51	47	51	47
	Nasal width,	27	26	26	28	22	27	28	26	26	25
	Nasal Index,	*54*	*60·5*	*52*	*60*	*46*	*53*	*55*	*55*	*51*	*53*
	Orbital width,	40	38	41	43	38	39	40	39	42	41
	Orbital height,	38	30	37	33	34	34	36	31	31	30
	Orbital Index,	*95*	*79*	*90*	*77*	*89·5*	*87*	*90*	*79·5*	*74*	*73*
	Palato-maxillary length,	60	59	59	67	58	62	59	61	63	61
	Palato-maxillary breadth,	70	64	66	74	71	66	65	63	66	68
	Palato-maxillary Index,	*117*	*108*	*112*	*110*	*122*	*106*	*110*	*103*	*105*	*111*
Lower Jaw.	Symphysial height,	35	...	...	36	34	30	30	...	...	33
	Coronoid ,,	69	...	...	78	66	61	64	...	...	57
	Condyloid ,,	60	...	...	73	60	62	62	...	...	58
	Gonio-symphysial length,	105	...	...	107	92	91	91	...	...	98
	Intergonial width,	102	...	...	113	91	94	103	...	...	100
	Breadth of ascending ramus,	39	...	...	43	39	39	37	...	...	43

* With pelvis.

tion of the sutures of the cranial vault, the degree to which this had taken place varying in different specimens. The tendency to bone formation in these Australian skulls, which gave rise to their weight and other peculiarities, affected also the condition of the sutures, so as to occasion obliteration at an earlier age than is the case in European skulls. No skull was metopic, but in the male youth indications of a frontal suture traversing the glabella were seen. Small Wormian bones were present in the lambdoidal suture in a few skulls, but there was no example of an interparietal bone. In several crania the spheno-parietal articulation was reduced to less than 5 mm. In three the squamous-temporal and frontal articulated directly at the pterion, either on one or both sides; in

TABLE IV.—AUSTRALIAN—MALES.

	Collection,	Benalla, Vict.	Hobson's Bay, Vict.	Fowler's Bay, S. Aust. Aet. 40	South Australia Coorong tribe.	Alexandra Land.	Eucla,* W. Aust.	Perth,* W. Aust.	Cape Leeuwin. W. Aust.	De Grey River, N.W. Aust.	Roebuck Bay, Lat. 18°.
	Age	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.
	Sex,	M.	M.	M.	M.	M.	M.	M.	M.	M.	M.
	Cubic capacity,	1270	1336	1235	1400	1218	1334	1310	1356	1450	1044
	Glabello-occipital length,	183	190	190	200	187	200	189	194	198	180
	Ophryo-occipital ,,	181	188	188	196	182	197	185	191	197	178
	Basi-bregmatic height,	136	137	134	131	130	136	134	136	134	130
	Vertical Index,	*74*	*72*	*70*	*65*	*69*	*68*	*71*	*70*	*68*	*72*
	Minimum frontal diameter,	96	100	103	102	99	104	104	102	102	95
	Stephanic ,,	116	115	115	113	105	109	113	113	112	100
	Asterionic ,,	107	108	112	114	110	116	110	120	112	110
	Greatest breadth,	133*s*	136*s*	129*s*	137*s*	132*s*	132*s*	137*p*	134*s*	134*s*	122
	Cephalic Index,	*73*	*72*	*68*	*68·5*	*71*	*66*	*72·5*	*69*	*68*	*68*
	Horizontal circumference,	522	537	527	560	515	560	530	537	550	500
	Frontal longitudinal arc,	128	135	133	134	128	132	131	133	138	127
	Parietal ,, ,,	137	132	135	138	123	132	134	133	148	126
	Occipital ,, ,,	109	108	107	124	113	119	119	107	114	111
	Total ,, ,,	374	375	375	396	364	383	384	373	400	364
	Vertical transverse arc,	296	292	290	295	283	287	294	298	292	274
	Length of foramen magnum,	34	31	36	33	33	39	31	38	33	29
	Basi-nasal length,	102	111	106	105	106	109	102	112	105	100
	Basi-alveolar length,	108	108	105	109	106	106	102	108	105	108
	Gnathic Index,	*106*	*97*	*99*	*104*	*100*	*97*	*100*	*96*	*100*	*108*
	Interzygomatic breadth,	...	135	136	139	138	146	134	144	136	120
	Intermalar ,,	123	124	128	128	121	135	120	129	124	112
	Ophryo-alveolar length,	91	96	87	95	86	91	89	80	84	93
	Naso-alveolar ,,	68	74	66	70	66	71	66	60	60	71
	Facial Index,	...	*71*	*63*	*68*	*62*	*62*	*66*	*55*	*62*	*77*
	Nasal height,	48	56	49	51	48	51	50	48	47	55
	Nasal width,	29	27	25	28	27	26	25	26	26	28
	Nasal Index,	*60*	*48*	*51*	*55*	*56*	*51*	*50*	*54*	*55*	*51*
	Orbital width,	41	40	40	42	40	46	41	41	42	38
	Orbital height,	32	35	33	38	31	33	30	30	32	32
	Orbital Index,	*78*	*87·5*	*82·5*	*90·5*	*77·5*	*72*	*73*	*73*	*76*	*84*
	Palato-maxillary length,	65	61	62	66	62	63	58	59	64	68
	Palato-maxillary breadth,	66	70	63	65	69	70	65	66	69	68
	Palato-maxillary Index,	*101·5*	*115*	*102*	*98·5*	*111*	*111*	*112*	*112*	*108*	*100*
Lower Jaw.	Symphysial height,	32	33	...	34	36	32	32	32	31	33
	Coronoid ,,	68	63	...	71	66	68	64	62	67	65
	Condyloid ,,	68	59	...	65	55	63	62	56	57	64
	Gonio-symphysial length,	105	98	...	97	91	103	87	101	91	97
	Intergonial width,	105	103	...	97	91	101	86	98	88	91
	Breadth of ascending ramus,	41	39	...	37	35	40	38	42	38	...

* With pelvis.

two there were small epipteric bones. In a youth's skull from the Murray River the antero-inferior angle of the parietal was very elongated, and the parieto-sphenoid suture was only 4 mm. broad. In a male two small ossicles were in the palato-maxillary suture. Faint indications of a maxillo-premaxillary suture were occasionally seen on the palatal surface. The malar bone was not divided in any specimen. In one youth's skull, although the basi-cranial synchondrosis was open, one of the styloid processes was ossified to the temporal bone.

The vertical diameter of the os planum was in several instances short, and in the Cape Leeuwin, Roebuck Bay, Gipps Land, and Alexandra Land skulls, this part of the ethmoid terminated in a point anteriorly, so that the ethmoid and lachrymal barely

TABLE V.—AUSTRALIAN—FEMALES.

	Collection	E.U. A.M. N.S.W.	E.U. A.M. No. 67. N.S.W.	N.S.W. No. 1.	Lower Murray, N.S.W.	Gipps Land. No. 1.	Gipps Land. No. 2.	Gipps Land. No. 3.	Benalla, Vict.	Port-and Bay, Vict.	Chal. West* Vict.	Lake Alex., S. Aust
	Age,	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad	Ad.
	Sex,	F.	F.	F.	F.	F.	F.	F.	F.	F.	F.	F.
	Cubic capacity,	1088	930	1146	1098	1156	1140	..	1115	946	1192	1220
	Glabello-occipital length,	184	164	181	176	180	182	173	184	176	172	180
	Ophryo-occipital ,,	184	164	181	175	180	182	171	182	174	172	178
	Basi-bregmatic height,	122	110	128	128	124	123	...	130	122	124	130
	Vertical Index,	*66*	*67*	*71*	*73*	*69*	*67*	...	*71*	*69*	*74*	*72*
	Minimum frontal diameter,	96	84	92	93	94	90	93	98	86	88	94
	Stephanic ,,	103	98	106	107	107	99	102	110	95	100	105
	Asterionic ,,	106	94	100	104	107	108	103	108	95	104	105
	Greatest breadth,	130*s*	118*s*	130*s*	125*s*	132*s*	132*s*	128*s*	124*s*	119*s*	134*s*	131*s*
	Cephalic Index,	*71*	*72*	*72*	*71*	*73*	*72·5*	*74*	*67*	*68*	*78*	*73*
	Horizontal circumference,	510	455	500	493	501	505	488	502	484	488	508
	Frontal longitudinal arc,	125	113	126	126	122	113	118	121	117	119	124
	Parietal ,, ,,	121	116	114	121	128	128	120	120	119	126	120
	Occipital ,, ,,	110	111	120	110	110	112	...	113	104	105	111
	Total ,, ,,	356	330	360	357	360	353	...	354	340	350	355
	Vertical transverse arc,	268	254	282	275	274	275	278	273	253	280	278
	Length of foramen magnum,	36	28	30	31	34	35	...	35	33	36	34
	Basi-nasal length,	98	85	100	93	95	101	...	108	95	94	101
	Basi-alveolar length,	...	88	92	92	94	99	...	110	100	90	104
	Gnathic Index,	...	*103·5*	*92*	*99*	*99*	*98*	...	*102*	*105*	*96*	*103*
	Interzygomatic breadth,	...	...	121	116	127	...	...	125	124	124	130
	Intermalar ,,	...	...	109	104	115	112	...	116	114	106	116
	Ophryo-alveolar length,	...	70	81	75	73	82	...	82	89	82	90
	Naso-alveolar ,,	...	52	61	55	56	62	...	62	69	59	66
	Facial Index,	...	...	*67*	*64*	*57*	...	...	*65*	*72*	*66*	*69*
	Nasal height,	...	37	48	43	43	51	...	47	48	44	49
	Nasal width,	...	22	26	25	24	25	...	24	24	23	25
	Nasal Index,	...	*59·5*	*54*	*58*	*56*	*49*	...	*51*	*50*	*52*	*51*
	Orbital width,	...	34	35	38	39	41	...	39	38	36	37
	Orbital height,	...	29	33	35	32	37	...	33	36	33	35
	Orbital Index,	...	*85*	*94*	*92*	*82*	*90*	...	*85*	*95*	*92*	*95*
	Palato-maxillary length,	...	50	51	50	54	54	...	61	57	48	60
	Palato-maxillary breadth,	...	53	60	54	62	61	...	64	62	55	68
	Palato-maxillary Index,	...	*106*	*118*	*108*	*115*	*113*	...	*105*	*109*	*114·5*	*113*
Lower Jaw.	Symphysial height,	...	...	25	...	...	...	...	...	28	25	29
	Coronoid ,,	...	...	50	...	...	...	...	...	56	50	61
	Condyloid ,,	..	...	45	...	...	...	...	...	52	54	57
	Gonio-symphysial length,	...	..	85	...	...	...	...	...	86	83	89
	Intergonial width,	...	...	88	...	...	...	...	...	91	82	86
	Breadth of ascending ramus,	...	...	32	...	...	...	...	...	30	...	38

* With pelvis.

articulated with each other, and the orbital plates of the frontal and superior maxilla were almost in contact. The occurrence of this arrangement in the Roebuck Bay skull added another to the ape-like characters of this cranium referred to on p. 32. In the Perth skull the orbital surfaces of the two lachrymals were remarkably small, the maximum length being 11 mm. and the breadth 6 mm. In three males and one female the anterior palatine foramen was unusually large, reaching 5 mm. in its transverse

TABLE VI.—AUSTRALIAN—YOUNG SKULLS.

	Collection,	Murray, N. S. W.	N. S. W. No. 2.	N. S. W.	Lower Murray, N. S. W.
	Age,	Aet. 16.	Aet. 16.	Aet. 18.	Aet. 18.
	Sex,	M.	M.	F.	F. (?)
	Cubic capacity,	1295	1252	1066	1265
	Glabello-occipital length,	188	183	182	182
	Ophryo-occipital „	187	181	180	182
	Basi-bregmatic height,	128	129	133	131
	Vertical Index,	*68*	*70·5*	*73*	*72*
	Minimum frontal diameter,	98	90	98	91
	Stephanic „	109	108	112	108
	Asterionic „	108	104	100	103
	Greatest breadth,	129*s*	127*p*	127*p*	131
	Cephalic Index,	*69*	*69*	*70*	*72*
	Horizontal circumference,	520	504	502	501
	Frontal longitudinal arc,	134	129	135	127
	Parietal „ „	133	120	141	130
	Occipital „ „	121	112	104	116
	Total „ „	388	361	380	373
	Vertical transverse arc,	281	283	289	283
	Length of foramen magnum,	31	31	32	29
	Basi-nasal length,	95	102	95	100
	Basi-alveolar length,	95	106	98	100
	Gnathic Index,	*100*	*104*	*103*	*100*
	Interzygomatic breadth,	120	118	...	117
	Intermalar „	108	106	109	104
	Ophryo-alveolar length,	72	80	77	78
	Naso-alveolar „	52	61	70	63
	Facial Index,	*60*	*68*	...	*67*
	Nasal height,	40	45	49	46
	Nasal width,	21	21	24	29
	Nasal Index,	*52·5*	*47*	*49*	*63*
	Orbital width,	38	37	38	37
	Orbital height,	30	32	31	32
	Orbital Index,	*79*	*86·5*	*82*	*86·5*
	Palato-maxillary length,	53	58	60	55
	Palato-maxillary breadth,	65	62	65	64
	Palato-maxillary Index,	*123*	*107*	*108*	*116*
Lower Jaw.	Symphysial height,	...	28	28	28
Lower Jaw.	Coronoid „	...	53	53	52
Lower Jaw.	Condyloid „	...	46	51	45
Lower Jaw.	Gonio-symphysial length,	...	86	80	83
Lower Jaw.	Intergonial width,	...	84	...	85
Lower Jaw.	Breadth of ascending ramus,	...	38	34	29

diameter. I did not see in any of the crania an exostosis within the external meatus; a third occipital condyle; a paramastoid process, except in the most rudimentary form; or a complete pterygo-sphenoid foramen, although in a Swan Hill skull such a foramen was almost formed. In several specimens a suture extended from the infra-orbital foramen through the lower border of the orbit into the infra-orbital canal.

The lower jaw was not so strongly developed as might have been expected from the massiveness of the skull generally. In the Riverina and some other males the rami were large, the angle almost rectangular, and the chin square; but the mental region was often feeble and with scarcely any forward projection at its lower border. The intergonial width was sometimes greater, at others less than the gonio-symphysial length. The coronoid height was, with few exceptions, greater than the condyloid; the sigmoid notch had not any great depth, though it was not so shallow as in the Bush crania.

The mean cephalic index of the thirty-one adult crania was 70; that of the twenty males was 69; that of the eleven females was 72. Each skull was dolichocephalic, with the sole exception of the female from Victoria presented by Mr. J. Dawson, the length-breadth index of which was 78. Setting this skull on one side, the ten female crania ranged from 74 to 67, whilst the males ranged from 73 to 61·5. The mean cephalic index of the adult females was therefore greater than that of the adult males. The mean length-breadth index of the four youths' crania was 70. A most noticeable feature in these Australian skulls was the great length of so many of the male crania, four of which were each 200 mm. long, and eight others were between 190 and 200 mm. They are indeed the longest normal skulls that have been measured in the course of this enquiry. The adult male from Portland Bay with a length of 200 mm., had a breadth of only 123 mm. All the sutures of the cranial vault were ankylosed, and from the very complete obliteration of the sagittal and the ridge-like elevation of its region, together with the scaphocephalic form of the skull, it is not unlikely that this suture may have been prematurely closed, which would account for the little breadth of the cranium and its abnormally low cephalic index, 61·5.[1] In the male from the Wannon River, with the low index of 65, and in the Riverina skull with an index of 66, there was no premature synostosis, although the sagittal suture was partially obliterated through age. The female skull from Portland

[1] In the Anatomical Museum of the University is a very characteristic adult scaphocephalic skull, which I described and figured in the *Natural History Review*, vol. iv. p. 94, fig. 1, 1864. Its glabello-occipital length was 202 mm., its transverse diameter 130 mm., and its cephalic index 64. The well-known traveller Baron de Miklucho-Maclay describes in the *Proc. Linn. Soc. New South Wales*, vol. viii. p. 401, pl. xix., 1883, a very dolichocephalic skull collected in Queensland, but now in the Australian Museum, Sydney. The cephalic index is 58·3 the vertical index 64·8. The glabello-occipital length is 204 mm; breadth 119 mm.; height 131 mm. He states that the skull shows no evidence of deformity, but in his description and figure he points out that the sagittal suture is completely obliterated. This character combined with the scaphocephalic shape of the skull leads me to think that its length and narrowness were due to premature synostosis of the sagittal suture. Dr. Barnard Davis has also described and figured (*Natuurkund. Verhandel. Holland. Wetensch. Haarlem*, 1865) a very interesting scaphocephalic skull from the Macleay River district, N.S.W., the length of which was 210 mm., the breadth 121 mm., and the height 134 mm. The cephalic index was only 57, and the vertical index was 63. I may also refer to the scaphocephalic skull of an Egyptian mummy described by me in the *Edin. Med.*

Bay, which was only 119 mm. in its parietal diameter, had also a complete obliteration of the coronal and sagittal sutures, and a shape approximating to the scaphocephalic.

The mean vertical index of thirty adult crania was 70·4 ; that of the twenty males was 70·6, that of ten females was 69·9, so that the difference between the two sexes was very slight. The mean basi-bregmatic height of twenty males was 135 mm. ; the minimum in two specimens was 130, the maximum in one 146 ; in two specimens only the maximum exceeded 140 mm. The mean basi-bregmatic height of ten females was 124 mm. ; only two specimens reached 130 mm., and one was as low as 110 mm. The difference, therefore, between the height of the two sexes was very remarkable, andgreatly to the advantage of the males. In eight of the male crania the actual height was either equal to or within 2 mm. of the greatest breadth in the same skull ; in nine skulls the height was distinctly greater than the breadth, in two the height was less than the breadth. In the female skulls the height and breadth were almost equal in one specimen; the height was greater than the breadth in three, but less than the breadth in six. Hence in the females it was not only the rule for the basi-bregmatic height to be less than the greatest breadth, but the mean altitudinal diameter was in relation to the length less than the transverse diameter. The skulls were tapeinocephalic.

The mean gnathic index of twenty-nine skulls was 100·3 ; that of twenty males was 100·6, that of nine females was 99·7 ; the average for each sex, as well as for both sexes collectively, brought this index into the mesognathous series according to the division employed by Prof. Flower. The maximum index in the males was 108, and seven specimens were 103 or upwards, *i.e.*, had a decidedly prognathous index, whilst eight were mesognathous and five were orthognathous. The maximum index in the females was 105, and three specimens only were 103 and upwards. In the four youths' crania the mean gnathic index was 101·7, being somewhat higher than that of the adults.

The mean nasal index of twenty-nine skulls was 53·4 ; that of twenty males was 53·47, that of nine females was 53·2. The average for each sex, as well as for the two sexes collectively, was platyrhine. The highest index in the male series was 60·5, and twelve specimens were 53 or upwards ; one the Mudgee skull was 46, *i.e.*, in the leptorhine series, whilst seven were mesorhine. The highest index in the female series was 59·5, and four were above 53, whilst the remaining five were mesorhine. The mean of the four youths was 52·9, *i.e.*, on the verge of the platyrhine group.

The mean orbital index was 84 ; that of twenty males 81·4, that of nine females 90. The average on the two sexes collectively was mesoseme; that of the males microseme, that of the females megaseme. In the males twelve were below 84, *i.e.*, microseme ; three were mesoseme, whilst five were megaseme. In the females the whole with one exception were megaseme. The mean orbital index in the youths' crania was 83·5.

Journ., July 1865, the cephalic index of which, calculated on a parietal breadth of 4·3 inches, was only 53, but, calculated on a mastoid breadth of 4·8 inches, was 59.

The mean palato-maxillary index was 109; that of twenty males 108·7, that of nine females 111, so that they were somewhat less dolichuranic than the males. In one male the palato-maxillary length was 1 mm. greater than the breadth, in one the length and breadth were equal, in four the breadth exceeded the length by not more than 3 mm., and in one only was the breadth greater than the length by more than 10 mm. In two females the breadth was only 3 mm. greater than the length, and in one only was the breadth as much as 9 mm. greater than the length. In the youths' crania the mean palato-maxillary index was 113·5. As a rule those crania that possess a low palato-maxillary index have at the same time a high gnathic index. Thus the male Coorong from Adelaide with p. m. index 98·5 has a gnathic of 104; the male from Roebuck Bay with p. m. i. 100 has a gnathic 108; the male from Benalla with p. m. i. 101·5 has a gnathic 106. In these cases a dolichuranic palate is associated with prognathism, and the prognathic condition is largely due to a forward projection of the alveolar border in the incisor region. In all these cases the palato-maxillary region was not only long relatively to its breadth, but its actual length was considerable, and in the Roebuck Bay specimen it reached 68 mm. Some others, however, with long palato-maxillary regions and high gnathic indices, had not such low palato-maxillary indices, owing to the greater breadth of the region, and in these skulls the palate was large in both dimensions. I may especially name as examples the magnificent male skull from the Riverina, the palato-maxillary region of which was 67 mm. long, the gnathic index was 103, and the palato-maxillary was 110; the skull from the de Grey River with a palato-maxillary length 64, a gnathic index 100, and a palato-maxillary index 108. In the Mudgee skull the gnathic index was also 100, but the palato-maxillary index was as high as 122, for the palate was only 58 mm. long, whilst its breadth was 71 mm.—the broadest palate in the series of Australian skulls, except the Riverina specimen. In such cases the degree of prognathism is probably due to some other cause than a mere projection of the alveolar border.

The mean cubic capacity of thirty adult crania was 1230 c.c.; that of twenty males was 1293·7; that of 10 females was 1103; the males ranged from 1514 c.c. to 1044 c.c.; the females from 930 c.c. to 1220 c.c.; the mean of each sex was therefore microcephalic, and only five male skulls exceeded 1350 c.c., the upper limit of the microcephalic series.

The sexual characters were strongly marked in the Australian crania. The much smaller size and capacity of the female skull, its comparative lightness, the feebleness of its ridges and processes, more especially the glabella; its low basi-bregmatic height and the high orbital index, all constituted important features of difference between the female and the male skulls.

These Australian skulls were in their mean proportions dolichocephalic, tapeinocephalic, phænozygous, mesognathic, platyrhine, mesoseme, dolichuranic, and microcephalic.

Since the publication by Blumenbach, in his third and fourth Decades,[1] of figures and

[1] Göttingen, 1795, 1800.

descriptions of the two New Holland skulls which were presented to him by Sir Joseph Banks, and of the description and figures by W. Gibson[1] and Alex. Monro, *tertius*,[2] of the skull of a New Hollander, the craniology of the aborigines of Australia has excited so much attention that a very extensive literature is now in existence. As the task of making an analysis of this literature, of naming the various writers, and of drawing up a comparative description of the skulls of the different tribes that have been examined, has already been so admirably performed by MM. de Quatrefages and Hamy, in the Crania Ethnica it is unnecessary for me to travel over their ground. Since the publication of their chapter on the Australian crania, however, two additional important contributions on the subject have been made by Prof. Flower, viz., the measurements of the skulls in the Museum of the Royal College of Surgeons[3] and a lecture on the Native Races of the Pacific,[4] also some minor papers by other writers, which have given further material for comparison.

It may now, therefore, be useful to compare the general results which I have arrived at from the examination of the Australian crania described in this Report with those of the above eminent craniologists. MM. de Quatrefages and Hamy give 71·19 as the mean cephalic index deduced from eighty-two observations on both male and female skulls (p. 321), many of the measurements of which were not made by themselves, but collected from the writings of their predecessors. They give, however, detailed measurements of thirty-eight skulls, which they divide into two types. The first type, consisting of thirty-one skulls, which represents the ordinary form of Australian cranium, they divide into coast tribes and tribes from the interior. Belonging to the coast tribes were fourteen male skulls, with a cephalic index of 69·89, and ten females with an index of 72·57. Belonging to the tribes of the interior were four males, C. I. 71·2, and three females, C. I. 73·74. The second type they name dolicho-platycephalic, from the length and lowness of the cranium; four male skulls belonging to it had a cephalic index 69·27, and three females, C. I. 72·37. The mean of the entire series of thirty-eight crania was 71·5. Prof. Flower does not propose any division into types of the fifty-four crania the characters of which he has analysed in his Native Races. Forty-nine of these were adults,—twenty-six males, nineteen females, and four doubtful. The male adults had a cephalic index 71·2, the females 72·3, the mean of the series being 71·75. These skulls, with three exceptions, range from 67 to 74, and of the exceptions one has an index of 75, one of 76, and one of 78. It should be remembered, however, that Prof. Flower excludes the glabella in his measurement of the antero-posterior maximum; if this had been included it is probable that one, if not two, of the exceptional crania might have been included with the rest in the dolichocephalic category. He

[1] Dissertatio de forma ossium gentilitia, Edinburgh, 1809.

[2] Outlines of the Anatomy of the Human Body, vol. i. p. 379, pl. xx. fig. 2; vol. iv., Edinburgh, 1813.

[3] Catalogue, Osteological series, 1879.

[4] *Proc. Royal Inst. of Great Britain*, May 31, 1878.

refers also to ten male skulls, which he measured in the Army Medical Museum at Netley, with a mean index of 72, and he lays down the general proposition that the average cranial index of the Australian skull is 72, or slightly less, and that they are therefore to be placed among the most dolichocephalic of races.

The mean cephalic index of the thirty-one adult crania measured in this Report was only 70, that of the twenty males 69 ; of the eleven females 72, but one of the female skulls had an index of 78, and it may be a question if this woman was of pure aboriginal blood. My average is therefore less than that of the above observers, which is to be accounted for in part by a considerable proportion of my crania possessing so great an antero-posterior maximum, in part by two of the skulls being unusually elongated, apparently by premature sagittal synostosis, but still more by my longest measurement always including the glabella, which formed so marked a projection in the majority of the male skulls, and by including which the dolichocephalic character of the crania is necessarily increased. My observations agree with those of my predecessors in giving to the female Australian skull a higher length-breadth index than to the male skull.

The mean basi-bregmatic height of forty-five specimens (apparently of both sexes) referred to by MM. de Quatrefages and Hamy (p. 323) was 135 mm. The fourteen male skulls of the coast tribes, in their 29th Table, had the same average height, whilst the ten females were only 131 ; the four males from the interior again were 141, the females 133 ; whilst of their dolicho-platycephalic group of crania, the four males were only 124 mm., but the three females were 127. They place the mean vertical index of the whole series of forty-five crania at 73·36, whilst that of the series of thirty-eight skulls recorded in their 29th Table is 71·7, the males being 70·3, the females 73·1. I have extracted from Prof. Flower's catalogue the basi-bregmatic height of thirty-nine males and of twenty-four females. The mean height of the former is 133 mm., that of the latter 126·5 mm. Prof. Flower himself places the vertical index in the male skulls at 72, in the female at 71·1, and in the whole series at 71·5 ; but in the ten male skulls in the Netley Museum the mean is 74.

If the vertical index in my series of crania be compared with that obtained by the above observers, it will be seen to be less than theirs, viz., 70·4 as against 71·7 and 71·5, which is without doubt owing to the glabella being included in my antero-posterior maximum but not in theirs. My observations accord with those of Prof. Flower in giving to the females a less vertical index than to the males, and we are both in marked contrast to the computations of MM. de Quatrefages and Hamy, in whose 29th Table the height index of the females exceeds that of the males in the proportion of 73·1 to 70·3. This statement by the French craniologists is so opposed to the experience of others that one is tempted to ask if in the drawing up of their table some error has not accidentally been made in their computations.

Prognathism, as estimated by the relative proportions of the basi-nasal and basi-

alveolar diameters, is not a necessary condition of the Australian skull. Prof. Flower places (New Cat.) the gnathic index of fifty-one specimens at 103·6 which brings them just within the prognathic division, but in his "Native Races" he states that there is considerable individual variation in these crania, as in five out of forty-two specimens the basi-alveolar diameter was less than the basi-nasal, and in seven specimens these two diameters were equal. The range of individual variation in my series of crania was from 92 in a female to 108 in a male skull, and the mean gnathic index was not so great as in the College of Surgeons specimens, so that the average was mesognathic. In the College of Surgeons series this index in the females was nearly 105, and more than in the males, where it was 103; but in my series the male average of 100·6 was greater than the female average of 99·7.

The mean nasal index obtained by MM. de Quatrefages and Hamy, by Prof. Flower, and by myself, places the Australian skull in the platyrhine division, but whilst the average of thirty-one skulls measured by the first named was 57·9, and that of Prof. Flower was 56·9, my average was considerably lower, only 53·5. Of the twenty-nine specimens which I measured, sixteen were platyrhine, twelve were mesorhine, and one was leptorhine. The presence of a leptorhine nose amongst the Australians is so rare that the authenticity of any specimen possessing this character requires to be well established. Of the authenticity of the skull of the Mudgee tribe, with its nasal index only 46, there can be no question. The circumstances under which it was got are related in the note p. 29, and, moreover, it was one of the skulls from which an incisor tooth had been extracted at puberty. The anterior nares in this specimen were not only narrow in relation to the height, but their absolute width was only 22 mm. The skull of a Hobson's Bay native had also a nasal index of only 48, one from Gipps Land 49, specimens from Perth and Portland Bay of not more than 50, Roebuck Bay 51[1], and all these were genuine Australian crania. Hence individual crania may possess a much lower nasal index than has usually been ascribed to the skulls of this race.

The mean orbital index of thirty-one skulls in MM. de Quatrefages and Hamy's table is 78·81, that obtained by Prof. Flower from fifty-one skulls is 80·9. These observers, therefore, have placed the Australian skull in the microseme series, which corresponds with my measurements of the male skulls; but owing to the megaseme proportions of so large a number of my female skulls, my average of the whole is raised to 84, which brings them just within the mesoseme series. In MM. de Quatrefages and Hamy's table, as well as in my own, the female index is considerably higher than the male, more so indeed than seems to have been obtained by Prof. Flower in his measurements, who in his "Native Races" places the male orbital index at 81·8, and the female at 82·9.

[1] Although the Roebuck Bay skull has a nasal index of only 51, *i.e.*, was mesorhine, yet the width of the anterior nares 28 mm., was only 1 mm. less than the widest of all the crania measured. Its diminished index was therefore due to the height of the nose 55 mm., which, with one exception, reached its maximum amongst the Australians in this specimen.

I am not aware of any other observations than my own on the palato-maxillary index in the Australian skull, which, as is shown on p. 39, is dolichuranic.

In their cubic capacity the Australian skulls are microcephalic. The average obtained by MM. de Quatrefages and Hamy is 1269 c.c., that by Prof. Flower is 1298, and that by myself is 1230; results which closely approximate, and definitely establish the microcephalic character of these people. We are also in accord in placing the capacity of the female skull as distinctly below the male. As far as the capacities of the individual skulls have been recorded, it is clear that not only is the mean of the race a low one, but that individual skulls do not attain a high capacity, such as one sees in the more cultivated races. Thus in Prof. Flower's series, thirty-two of which were gauged, only eight specimens were 1400 c.c. and upwards, and the highest of these was 1460 c.c.; whilst in my series of thirty-four crania, only three specimens were 1400 c.c. or upwards, and the highest of these, a male from Port Curtis, Queensland, was 1514 c.c.

From the above analysis the general characters of the Australian skulls may be summarised as follows:—markedly dolichocephalic, tapeinocephalic, not strongly prognathic, as a rule platyrhine, microseme or mesoseme, dolichuranic and microcephalic.

It is generally admitted that the northern and north-west coasts of Australia have been visited by both the Papuans and the Malays, and it is possible that the Polynesians may also have landed on the north-east coast. It is not unlikely that small colonies of these races may have been established on the Australian sea-board, and that there a certain local intermixture with the aboriginal Australian people may have taken place. Putting aside, however, these local and occasional admixtures, the question has been discussed by various travellers and anthropologists, if the Australians are a homogeneous people, or if the aborigines of the great island-continent consist of more than one race.[1] I need not enter into a full analysis of the evidence which has been advanced on the one side or the other, but may content myself with referring to two or three prominent writers.

Dr. Martin describes[2] from personal observation the natives of the district of Roebuck Bay in the North West, and states that those of the interior excel those of the sea coast in bodily structure. They are more muscular, taller, and apparently more intelligent; the profile more resembling that of a Polynesian than that of an Australian proper. They are however, black, and the hair is in spiral locks about three or four inches in length, wavy-crisp or frizzled, though not strongly, and jet-black. He gives the measurements of one skull, length 7·23 inches, breadth 5·31, facial angle 94°, upper jaw prognathic so as to give a very oblique insertion to the teeth. Dr. Topinard after a comparison of the

[1] In the Journal of the Anthropological Society of London, p. xxxii., published in the *Journ. of Anthrop.*, 1870, is a short report of a communication made by Dr. Carter Blake, from which it would appear that he considered three types of Australian skull to exist. The report is a mere abstract and without detail. See also Mr. Staniland Wake in *Journ. of Anthrop.*, 1871, and *Journ. of Anthropological Instit.*, vol. 1. 1872.

[2] *Journal of Royal Geographical Society*, vol. xxxv. p. 283, 1865.

descriptions of numerous travellers comes to the conclusion[1] that originally two distinct ethnological elements were indigenous to Australia. The one dolichocephalic, tall in stature, with robust and well proportioned bodies, long, straight, and smooth hair, and with the skin chocolate coloured. The other yet more dolichocephalic, of smaller stature and less robust, the skin black, the hair crisp and frizzly, the jaw very prognathic, and of less intelligence than the preceding. He thinks that the pure type of the inferior race is now extinct, but that it is preserved amongst many of the women of the tribes, and that the present people are the result of the crossing of the inferior and superior races.

On the other hand a very competent observer, Mr. R. Brough Smyth,[2] whilst making allowance for the local infusion of Papuan, Malay, or even Chinese blood, states that throughout Australia the natives exhibit a general conformity to one pattern as regards features, colour, and mental characters, so that "a man from Southern Gipps Land would be recognised as an Australian by the inhabitants of Port Essington, and a native of King George's Sound would be surely known if taken to York Peninsula." Prof. Giglioli also thinks[3] that the idea of a woolly haired race in Australia is due to the loose way in which the terms woolly and crisp have been used by explorers who were not anthropologists. With these different views before us, it will not be without interest to examine the collection of crania just described, to see if they present such diversities in form as might fairly be regarded as racial, and at the same time to ascertain what has been said on this matter by preceding craniologists.

Professor Huxley described and figured, about twenty years ago,[4] an Australian skull from Western Port which differed from the majority of Australian crania in being remarkably depressed at the vertex, and at the same time considerably elongated,[5] and he referred to other skulls from South Australia which possessed similar characters. He directed attention to certain features of resemblance between these crania and the Neanderthal skull. In a later work he has figured[6] one of these South Australian crania from near Adelaide (No. 5334 Cat. Roy. Col. Surgeons) and has again called attention to the Australoid character of certain ancient European crania. Prof. Flower in his new catalogue has given some of the dimensions of this Adelaide skull (No. 1072 New Cat.), which, with a length of 190 mm. possesses a cephalic index 70·5 and a vertical index of only 65·3. MM. de Quatrefages and Hamy, in an early fasciculus of the Crania Ethnica, on human fossil races, have discussed at some length (p. 39 *e.s.*) these conclusions of

[1] Étude sur les Races indigènes de l'Australie, *Bull. Soc. Anth.*, Paris, t. xii. p. 211, 1872. Also a critical review on the Australian Races in *Revue d'Anthropologie*, t. i. p. 298, 1872. Also in his Anthropologie, *op. cit.*

[2] The Aborigines of Victoria, London, 1878, vol. i. p. xvii. Mr. Smyth was for many years Secretary of the Board for the protection of the Aborigines.

[3] Viaggio intorno al Globo della corvetta "Magenta," Milan, 1876 ; quoted by MM. de Quatrefages and Hamy, p. 300.

[4] Man's place in Nature, p. 155, 1863.

[5] Prof. Flower has given in his new catalogue, p. 187, the dimensions of this skull from Western Port, from which it can be seen that the height 131 mm. slightly exceeded the breadth 130 mm. The vertical index was 73·6, the cephalic 73·0. The length was 178 mm.

[6] Prehistoric remains of Caithness, 1866, p. 131, figs. 62–65.

Prof. Huxley's, and agree with him in recognising an elongated and depressed skull as occasionally occurring in collections of Australian crania. This type they say is not widely diffused, and occurs especially in the Adelaide district, although specimens of a similar kind have been procured from other coast tribes. To crania of this type, whether they occur in the Australian or other races, they have given the name of dolicho-platycephalic. In a subsequent chapter (p. 300 *e.s.*), whilst they regard it as undoubted that in some parts of Australia different ethnic types are accidentally juxtaposed, and more or less fused, yet that, judging by the crania, the Australians proper are none the less one race, and that the differences seen in the crania are sexual rather than ethnic.

They give (p. 317) as an illustration of the dolicho-platycephalic type of skull a specimen presented by M. Erklund to the Museum Retzius (type No. 2). It differs, they say, from the ordinary type (No. 1) of Australian skull in having heavier supraciliary ridges, a much more depressed and more receding forehead, in a general flattening of the cranial vault, in a more considerable backward projection of the occiput, in a very abrupt change of curvature above the occipital protuberance, and in the almost complete horizontality of the base. This skull is markedly dolichocephalic. The antero-posterior diameter is 195 mm.; the greatest transverse diameter only 126 mm.; the basi-bregmatic diameter 125 mm. The length-breadth index is 64·6, the vertical index 64·1. They contrast these indices with those of a skull belonging to the ordinary Australian type, No. 1, in which they are respectively 67·0 and 73·19.

Prof. Flower in his Native Races refers to the collection of the College of Surgeons as containing a number of skulls belonging to a tribe from the neighbourhood of Adelaide of exceptionally depressed form, and in his Catalogue he gives their measurements as well as those of the other skulls in that collection. I have analysed his measurements of the Australian skulls, so far as regards the relative proportions of the cephalic and vertical indices, and find that of the sixty-four specimens, twenty-eight, viz., eleven males and seventeen females, had the vertical index less than the cephalic; six, viz., four males and two females, had their indices equal; whilst in thirty crania the vertical index was greater than the cephalic, and of these, twenty-two were probably males and eight females.

In the Thesaurus Craniorum and Supplement thereto by the late Dr. Barnard Davis,[1] the cephalic and vertical indices of the Australian skulls in his collection are recorded. I find that, after discarding those whose form had been altered by synostosis, or whose authenticity was somewhat doubtful, there remain twenty crania in which the relations of breadth and height to the length are stated. Of these seven, viz., five males and two females, had the vertical index less than the cephalic; in one, a female, the two indices were equal; and in the remaining twelve, eleven males and one female, the vertical index was greater than the cephalic.

[1] London, 1867 and 1875.

Since the previous part of this Report on the Australian skulls was in type, I have had the opportunity of examining fourteen additional Australian adult crania, seven of which were males, four females, and three doubtful, though probably females. These specimens, so far as the localities were known, were from Curtis Island, Moreton Bay, and Rockhampton in Queensland, from the neighbourhood of Sydney and Maitland in New South Wales, from the interior of South Australia and from the Milang tribe, Lake Alexandrina district.[1]

When these specimens are included along with the thirty adult skulls, the length, breadth, and height measurements of which are recorded in Tables III., IV., and V., my own observations extend to forty-four crania, which when analysed give the following results as regards the proportion between the cephalic and vertical indices in the two sexes. Fourteen, viz., four males and ten females, had the vertical index less than the cephalic; seven, viz., six males and one female, had these two indices equal; and twenty-three, viz., seventeen males and six females, had the vertical index greater than the cephalic.

By combining the measures which MM. de Quatrefages and Hamy have themselves made, those contained in Dr. Barnard Davis's collection, those recorded by Prof. Flower in his Catalogue, and the forty-four specimens measured by myself, a series of about one hundred and fifty Australian crania, derived both from the extensive coast-line and the interior of that great island-continent, is before us, from which the following conclusions may be drawn as to the relations of length, breadth, and height in the two sexes.[2]

In fifty-one specimens the vertical index was less than the cephalic, and of these twenty-one were probably males and thirty females; in fifteen these two indices were equal, and of these eleven were probably males and four females; in eighty-five the vertical index was greater than the cephalic, and of these sixty-seven were probably males and eighteen females.

As the localities from which one hundred and twenty-nine of the above crania were derived are known, it is now possible to form a general conclusion as to the parts of Australia in which the crania have a tendency to possess a vertical index below the cephalic, *i.e.*, to show dolicho-platycephalic proportions.

[1] These specimens are either in the Phrenological Museum in this city, in the collection of Dr. Arthur Mitchell, or have been recently presented to the Anatomical Museum of the University. A specimen, a male, from the Milang tribe of South Australia in the Lake Alexandrina district, 50 miles south-east of Adelaide, presented by Mr. R. S. Rogers, is especially interesting. It is a characteristic dolicho-platycephalic skull, length 191 mm., height 125 mm., breadth 130 mm. The vertical index is 65, the cephalic index 68. The glabella and supra-orbital borders are massive and projecting. The face was unfortunately injured, so that the orbital and nasal indices can only be given approximately as 72 and 56, *i.e.*, microseme and platyrhine. The gnathic and palato-maxillary indices could not be obtained.

[2] Dr. Lucæ has given in his Morphologie der Rassen-Schädel measurements of six Australian crania from the Clarence River district in the northern part of New South Wales, but his measurements cannot be combined with the above, as they were made by a different method. Dr. Schaaffhausen has, however, remeasured these and the other crania in the Senckenberg Museum in Frankfurt (*Archiv für Anthropologie*, Bd. xiv., Sup. 20, 1883), in which there are now seven skulls from the Clarence River. The five males and one female all possessed a greater height than breadth, the respective measurements being H. 140, B. 126; 136, 131; 140, 128; 132, 128; 136, 122; 129, 124. One female, on the other hand, was not so high as broad, the measurements being H. 123, B. 128.

Twenty specimens were from North Australia. Of these in only two, a female from Cape York, and a male from Alexandra Land, were the vertical indices less than the cephalic, in another, a female from Port Essington, these two indices were equal, but in the remaining seventeen from Cape York, Arnhem Land, Camp in Heaven,[1] Raffles Bay, and Port Essington the vertical index exceeded the cephalic, and of these, thirteen were probably males and four females.

Three specimens were from North-west Australia. In none was the vertical index less than the cephalic; in one, a male, from the De Grey river, these indices were equal; in one from Roebuck Bay and in one from Dampier Land, both of which were probably males, the vertical index exceeded the cephalic.

Twenty-one specimens were from Queensland. In none was the vertical index less than the cephalic. In four, two males and two females, these indices were equal, and of these one was from Port Curtis, and another from Curtis Island (lat. 23°, long. 151°). In seventeen, all apparently males, the vertical index was greater than the cephalic, and these were from Moreton Bay, Rockhampton, and the interior of the colony.[2]

Twenty-six specimens were from New South Wales. Seven of these, two males and five females, had the vertical index less than the cephalic, one was from Bathurst, one from the coast near the southern part of the colony, and the rest from parts of the colony not exactly specified. In three males from Swan Hill, Port Jackson, and the Murrumbidgee these two indices were equal. In sixteen, nine males and seven females, the vertical index was greater than the cephalic; these specimens were from the Riverina, Mudgee, Macquarrie, Swan Hill, Lower Murray, Maitland, M'Leay, Port Stephen, and Sydney districts.

Nine skulls were from West Australia. One, a male, from Perth, had the vertical index less than the cephalic; two males from King George's Sound and Swan River had these indices equal; five males and one female from Eucla, Cape Leeuwin, King George's Sound, and Swan River had the vertical index greater than the cephalic.

Victoria furnished twenty-eight crania. In six, two males and four females, the vertical index was less than the cephalic, and these skulls came from Gipps Land, Western Victoria, Lake Timboon, and Port Fairy. In one, a male, from Hobsons Bay, these two indices were equal. In twenty-one specimens, fourteen males and seven females, from Port Philip, Western Port, the Murray, Port Fairy, the Upper Yarra, the neighbourhood of Melbourne, Piccaninny Creek, Gobo Island, Lake Timboon, Benalla, and the Wannon River, the vertical index exceeded the cephalic.

[1] I give this locality on the authority of MM. de Quatrefages and Hamy. I have not been able to find the name marked on any map to which I have had access.

[2] In addition to the specimens from Queensland referred to in the text, I may state that ten skulls, all with one exception, from Bowen in that colony, are in the Godeffroy Museum, Hamburg. I observe from Dr. Krause's measurements that in six males and three females, the height is greater than the breadth, and in one female only is the reverse to be noted, the breadth in that specimen being 133 mm., the height 130 mm.

South Australia proper contributed twenty-two crania. Of these, seventeen specimens had the vertical index less than the cephalic, viz., ten males and seven females; the crania came from the neighbourhood of Adelaide, Port Augusta, Lake Alexandrina, the Milang tribe, and the Coorong tribe. Two, a male and a female, had the cephalic and vertical indices equal. In three males, from Fowlers Bay, Adelaide, and Port Augusta, the vertical index was greater than the cephalic.

It would appear, therefore, that in this large and varied series only two skulls occurred, collected to the north of the latitude of the southern boundary of Queensland, viz., a female from Cape York, and a male from Alexandra Land, in which the vertical index was less than the cephalic. On the other hand, from south of that latitude, a considerable number of crania possessing this character have been obtained. Victoria, N. S. Wales, and South Australia proper, but more especially the last named, have furnished the greater number. But along the whole southern seaboard, from Perth on the west to Gipps Land on the east, and more particularly in the district near Adelaide, dolicho-platycephalic skulls have been procured. The proportion which South Australia has furnished is so large that, of the twenty-two skulls from that colony, seventeen had the vertical index less than the cephalic, and two others had these indices equal.[1]

The question therefore now arises, is this difference in the relations of the two indices so marked and so constant that the people in whom it is found are either to be regarded as a race differing from those who do not possess this character, or that it is merely sexual. As regards its relation to the two sexes, it was not limited to the one or the other. Of the series of thirty-three crania exhibiting this character, probably seventeen were males and sixteen females, and in the South Australian group of these, ten were males and seven females. It is therefore so nearly equally manifested in the two sexes, that it cannot be said to distinguish one sex more than the other. It is more difficult to pronounce definitely as to its value in the discrimination of racial differences. Its great relative frequency in the tribes of the southern seaboard points to the conclusion that, in the natives of this part of the coast-line, a genetic tendency existed to develop skulls exhibiting this character.

But it would not be safe to state that, because of this difference in the single character of the relation of the breadth to the height of the skull, those with a vertical index lower than the cephalic were therefore of a different race from those whose vertical index was higher. And this the more so when we find that the relations of breadth and height are not constant in the people of the same district. Thus, of the four

[1] Since the above was written I have read M. Cauvin's paper in the *Bull. de la Soc. d'Anth. de Paris*, March 1883, on the races of Oceania, in which he argues that, owing to diversities in the details of structure in the Australian skulls, that race is not pure but mixed. He gives a table of the cephalic, nasal, and orbital indices of fifty-two crania from different parts of the island, but he does not refer to the height index, so that I cannot utilise his table in connection with the question of dolicho-platycephalism. Some of the skulls he has measured are mesaticephalic, others brachycephalic.

skulls from Adelaide in the Barnard Davis collection, whilst three had the vertical index less than the cephalic, in the fourth the height was greater than the breadth; of the two skulls from the same burial-ground near Port Augusta, in the Museum of the College of Surgeons, one had its vertical index less, the other greater than the cephalic; of the four skulls from Port Fairy in the same Museum, three had the vertical index less, the fourth greater than the cephalic.

The strongly projecting supraciliary ridges and glabella, which have also been described as characteristic features in the dolicho-platycephalic crania, are by no means confined to them. The skulls of the Milang and Coorong tribes, markedly dolicho-platycephalic, have undoubtedly massive ridges in the supra-orbital and supra-nasal regions, but other Australian skulls, in which the height considerably exceeded the greatest breadth, possessed this character in as great, if not a greater degree. Of the skulls which I have myself examined, the Riverina, Eucla, and Wannon River crania may be again referred to as exhibiting this character in a remarkable manner. The Riverina skull is probably one of the most massive in this region in any collection of Australian skulls, and yet, as may be seen in Table III., its height exceeded its greatest breadth by 14 mm. The dolicho-platycephalic cranium is not necessarily associated with great gnathic projection, for although in the skulls of the Coorong and Lake Alexandrina tribes, and in one from New South Wales (No. 67), the gnathic index was 103 or upwards, yet in another dolicho-platycephalic cranium from New South Wales (No. 1), and in two from Gipps Land, this index was below 100. Again, in Australian crania the height of which distinctly exceeded the breadth, as in a Queensland, the Riverina and Roebuck Bay specimens, a high gnathic index was found, that of the last named skull being 108. Neither does there seem to be any definite relation between dolicho-platycephalism and the nasal index, for although the Coorong, Lake Alexandrina, and Milang skulls, all from tribes in close proximity to each other, were distinctly platyrhine, the index of the Perth skull was 50, and in one of the Gipps Land specimens only 49, although in the other it was 56. On the other hand, amongst non-dolicho-platycephalic crania, as in a Queensland, the Riverina and Benalla specimens, the platyrhine index rose to 60.

As regards such physical characters as can be determined by an examination of the external form and general appearance of the natives, there does not appear to be any very definite evidence of the co-existence of two distinct races. In corroboration of the statement of Mr. Brough Smyth already quoted (p. 44), I may also refer to a short article on the Aborigines of South Australia by Mr. J. D. Woods,[1] in which he says that the same description will apply to the natives all around the coast-line. This probable homogeneousness of race is also borne out by a general uniformity of customs, laws, and weapons. So little is known of the Roebuck Bay natives, where Dr. Martin considered important differences to exist between the coast and interior tribes, that no definite opinion of the

[1] *Trans. and Proc. of Phil. Soc. of Adelaide, South Australia*, p. 81, 1878–9.

people in this locality can be arrived at. So far as I know, only one skull from this district is in any collection, and although, as I have pointed out in this Report, it presents certain remarkable characters, yet as there is only one specimen I am not prepared to say that they are anything more than individual peculiarities.

The evidence afforded by the study of the skulls of the Australians does not therefore appear to me to sustain the view that two or more distinct races of aborigines, since the discovery of Australia by Europeans, have been or are now living side by side. In no series of crania from one locality do we find such a combination of characters so marked as to differentiate them from the natives of another locality. The fact, however, that in South Australia proper, and in other places, more especially along the southern seaboard, there is a special tendency for the crania to possess a height index distinctly below that of breadth, would perhaps justify the inference that amongst those tribes an intermixture may at some previous time have taken place with a people in whose crania the height index was normally below that of the breadth, and that in proportion to the extent of this intermixture did this modification in the cranial indices show itself.

In connection with this I may refer to the relations of length, breadth, and height in the skulls of the now extinct Tasmanians, a people who, from their geographical position, and from the fact that they had constructed and attained considerable proficiency in the use of both canoes and rafts,[1] may at an early period of their unwritten history have migrated across Bass Strait. MM. de Quatrefages and Hamy in their twenty-first Table give the measurements of five Tasmanian men and three women. In the men the mean vertical index was 71·6, in the women 68·9, whilst the cephalic index in the men was 77·7 and in the women 75·2. Prof. Flower gives the measurements of the Tasmanian crania in the Museum of the College of Surgeons, and places the cephalic index of fourteen skulls at 76·3, and the vertical index of the same number at 72·6. In both these series therefore, the vertical index is much below the cephalic. But there is this important difference between the Tasmanians and the Australians, viz., the much higher cephalic index of the former, so that in their relation of length and breadth they are mesaticephalic. It is possible that the Tasmanians may have at a remote period occupied the southern part of Australia, and have been displaced by the present Australian race, but that an intermingling of the two races may have occurred along the southern sea-board.

On the other hand New Guinea and other islands to the northward are inhabited by a dolichocephalic race, whose crania, as will be described in subsequent pages, have a vertical index distinctly above the cephalic, and as they are a seafaring people, it is not unlikely that an infiltration of Papuan blood amongst the Australians may have taken place.

[1] See Mr. Brough Smyth's account of the Aborigines of Tasmania in vol. ii. of the Aborigines of Victoria, already cited.

ADMIRALTY ISLANDERS.

Plates III., IV., V., VI. Tables VII., VIII., XVIII., XIX.

The skulls from the Admiralty Islands were the most valuable part of the craniological collection, as apparently no Europeans had landed on these islands prior to the visit of H.M.S. Challenger, and skulls of the natives were unknown in our museums. They were collected in March 1875, in villages on the coast of Wild Island, one of the small islands off the north-western end of the main island, whilst the Challenger lay at her anchorage in Nares Harbour.

An interesting account of the physical characteristics of the inhabitants of these islands has been published by H. N. Moseley, Esq., one of the naturalists to the Expedition,[1] and as it will be useful to bring his description alongside of that which I am about to give of the crania, I reproduce it here.

TABLE VII.—"*Physical characteristics.*—The following measurements were taken:—

MEASUREMENTS in inches of NATIVES of the ADMIRALTY ISLANDS, taken by the late R. VON WILLEMOES SUHM, being of NATIVES of WILD ISLAND, except 6, 7, 8, 9, taken on board the ship by VON SUHM and H. N. MOSELEY.

		Height.	Breadth.	Arm Length.	Leg Length.	Foot Length.	Hand Length.	Nose Length.	Forehead Length.	Ear Length.	Breasts Length.		
WOMEN.	1. Old woman; 40 years ca.,	60	15	28	...	10	7	...	...	...	7		
	2. Young girl; 15 years ca.,	61½	15	25	33	9½	...	1⅞	...	2½	...		
	3. Older women of mean size,	60	12	25	...	9	6⅞	2	3	...	6½		
	4. Old female,	63	...	...	...	10	8	...	...	...	...		
	Mean,	61	14	26	33	9½	7½	2	3	2½	6¾		
											Mouth Length.	Penis Length.	Weight in lbs.
MEN.	1. Young man,	67	16	29	37	9½	7	2	2	2¼	2⅝	...	...
	2. Adult,	63	18	28	35	10½	7	2⅜	3	2⅞	...	...	...
	3. Adult,	63	17½	27½	34	9½	...	2	...	2½	3⅛	...	...
	4. Adult,	66	17½	28½	...	...	...	...	...	2⅝	...	...	...
	5. Oto,	67	17½	...	...	...	...	...	...	...	...	...	...
	6. Adult,	64¾	...	...	...	...	...	...	...	...	...	...	122
	7. Adult (photographed),	63	...	...	...	9¾	...	...	...	...	...	...	...
	8. Adult,	62½	17¼	27½	33½	10¼	8	1⅞	3	3	3	3	133
	9. Young man,	66¾	16	27	34	10	7½	2	3¾	...	...	3½	126
	Mean,	64⅞	17⅐	28	34⅜	9⅝	7½	2	3	3	3	3¼	127

[1] On the Inhabitants of the Admiralty Islands, *Journ. Anthrop. Inst.*, May 1877

"Further measurements of numbers 8 and 9.—8, girth of chest with arms held up, 36; 9, girth of chest, 33. Breadth of foot just behind origin of toes 14½. Girth at umbilicus, 30. Round buttocks, 34.

"Two heights of adult men taken by me, 68 and 60¾ inches.

"The measurements of the legs were taken from the great trochanter of the femur to the sole of the foot. Those of the breadth from tip to tip of clavicles. Those of the hand from the inner margin of the palm to the tips of the middle finger. Those of the forehead from the root of the nose to the commencement of the hair. The chest girth measurements were taken with the arms upheld.

"Average specimens were selected by von W. Suhm as far as possible. The mean height of the men, as will be seen from the table, is about 5 feet 5 inches. Whilst the tallest man measured was 5 feet 8 inches, and an unusually short one only a fraction over 5 feet, the mean height of the women is 5 feet 1 inch.

"It is difficult, and possibly of little value, to compare the measurements here obtained with those given in the Anthropological part of the 'Novara' publications, vol. iii., since the methods of measurement differ widely. I have, however, by adding together the lengths there given separately for fingers, hand, forearm, and arm, and treating this as the length of the arm, obtained the ratio of the length of the body to the length of the arm in several races, and compared it with the similar ratios in the case of the Admiralty Islanders, using the averages of the measurements where available. The results are shown in the following table:—

	Measurements in Millimetres.		
	Height.	Length of Arm.	Ratio of Height to Length of Arm.
New Zealanders, men,	1757	859	2·04
Australian men,	1675	819	2·04
Australian women,	1596	770	2·07
Tahitian women,	1614	772	2·09
German men,	1680	789	2·1
German women,	1544	713	2·1
Admiralty Island men,	1646	711	2·30
Admiralty Island women,	1549	660	2·30

"Whence it appears that the Admiralty Islanders are short armed.

"The race is of average height, but the weight is, as usual with savages, below that of Europeans; 126 lbs (nine stone), as compared with 150 lbs, about the weight of an average Englishman. The natives contrasted at first glance with the Papuans of Humboldt Bay in being far thinner and lankier. I saw but one native that was at all fleshy, although such were not uncommon at Humboldt Bay. The usual colour of the natives is a black-brown, often very dark, and darker than that of the Papuans of Humboldt Bay. The young girls and young boys appear much lighter as a rule than the adults. Some one or two of the younger women were of a quite light yellowish-brown, as was also one young man who came from a distance to the ship to trade. I saw no old women who were light coloured.

"The arms and legs of the men are covered with a short, sparse, curly black hair, which appears as

if growing in separate locks,[1] exactly as in the Humboldt Bay natives. Hair is rarely present in any quantity on the back or chest, but in a few exceptionally hairy examples it was well marked.

"The hair of the head, which is worn long only by the younger adult males, formed in them a dense mop, projecting in all directions 6 to 8 inches from the head. It appeared less luxuriant in growth than that of the Papuans of Humboldt Bay. The hair is crisp, glossy, and extremely elastic, and every hair rolls itself up into a spiral of small diameter.

"In general appearance, thus, it is fine curly like that of Fijians. On comparing it with a very small sample of hair of the natives of Humboldt Bay, taken from several native combs, the Papuan hair proves to be somewhat coarser; but in other respects the two hairs are closely alike, the diameters of the spirals of the curls being the same. Some hair from a native of Api, New Hebrides, is of about the same coarseness as the Admiralty Island hair, but the curls are of much smaller diameter. The hair of the Api Islanders seems to be remarkable for the fineness of its curls. In Tongan hair the curls are of far larger diameter than those of the Papuan or Admiralty Island hair.

"The fineness of the curl of the hair in various Polynesian and Papuan races which I have seen seems to be pretty constant in each race and characteristic. It might be estimated by measuring the diameter of the circles formed by the separate spirally twisted hairs, and taking the average of several measurements. No doubt a certain curve of the hair follicles corresponds with, and produces the curl in the hairs, as in the case of the hair follicles of the negro, as discovered by Mr. Stewart;[2] but the amount of curve will be peculiar to each race. The hair of both head and body of the Admiralty Islanders is naturally black, that of the head being of a glossy black.

"A very slight trace of whiskers is present in most of the men, as a small black streak on the very upper part of the cheek, looking almost like a continuation of the hair of the crown. Regular bushy whiskers were seen only in the case of one man, who had a continuous frill round his face, formed of conjoined whiskers and beard. This man was also remarkable for the greater hairiness of his body; hence I imagine that whiskers and hair generally on the face are exceptional, and not removed by shaving. One or two men had short pointed beards without whiskers.

"Eyebrows were generally absent, very probably shaved off (the natives made signs when offered razors that they used obsidian knives for shaving). I saw eyelashes long and well-developed in some youths.

"The eyes are not in the least oblique, and open full and widely. The iris is of a dark brown. The forehead is somewhat flattened. There is usually a well-marked depression at the origin of the nose, the brow thus somewhat overhanging. The cheek bones are prominent, the face diminishing rapidly beneath them, to terminate in the straight fronted chin. The nose is usually short, with wide alæ and flattened tip. The nostrils are not patent in the adults, or only just to be seen into under the alæ.

"In the children the noses are more flattened, and the nostrils somewhat more patent. The septum

[1] This appearance is probably merely due to the tendency of the hairs evenly distributed at their bases to collect together and combine into curls, and must not be taken to imply necessarily the existence of a condensation or aggregation of hair follicles at certain spots, producing hair growing in separate locks, which condition was formerly erroneously supposed to occur on the scalps of Papuans. The body hairs form small curly locks in other races.

[2] Charles Stewart, M.R.C.S., F.L.S., Note on the Scalp of a Negro, *Micr. Journ.*, 1873, p. 54.

[Dr. T. P. Anderson Stuart confirms the statement of the curve of the hair follicles in the negro, but places the papilla very much laterally to the opening of the follicle, so that the hair grows freely up out of the scalp, and the plane of the curl is vertical to the surface of the scalp. *Journ. Anat. and Phys.*, April 1882.—W. T.]

nasi in all the adults is perforated, and the lower margin of the perforation usually dragged down by the suspension of ornaments, so that in a profile view of the face the large aperture in the septum is looked through by the observer.

"Some of the natives, as at Humboldt Bay, have most remarkable long Jewish noses. About 1 in every 15 or 20 has such a nose. I at first imagined that this form of nose was produced to some extent by long action of excessively heavy nose ornaments, but I saw one youth of only 16 or 17 with such a nose very fully developed, and I saw more than one woman with a well-marked arched nose with dependent tip, and the women appear to wear no nose ornaments. An incomplete mixture of two races may possibly exist here, but unfortunately I did not carefully observe with this view whether the natives with Jewish noses showed other points in common in which they differed from the remainder of the population. One of the most marked instances of these peculiar features was that of the head man or chief of Wild Island (Oto).

"The lips are of a light brown, very slightly pinkish. They are usually very little prominent, and are not unusually large. The chins are usually straight in front, not rounded, and not prominent, sometimes apparently receding. The jaws are wide. The lower line of the jaws is remarkably straight and horizontal. The lobes of the ears are enlarged and dragged into a long loop by the weight of suspended ornaments. The penis is usually of moderate size. I saw only one man who had a remarkably large one.

"Some few of the women were large and stout. One woman that I saw must have been 5 feet 6 inches in height, but such women were exceptional.

"Drawings of the heads of three natives are given, enlarged from photographs, in Pl. xxiii. figs. 1, 2, 3.

"Variability. The occurrence of Jewish noses in a certain number of the Admiralty Islanders has already been described. As another instance of variability, I may state that I saw one boy on Wild Island who, though in other respects just like the rest, had his hair quite straight. Light-coloured skins were rare, but I saw one man and two women whose skins were of a light yellow colour."

General characters of the crania.—The collection of crania from the Admiralty Islands consisted of eleven skulls, a calvaria, and a face. Only one skull had the lower jaw attached, but there was in addition a loose lower jaw, which could not definitely be associated with any of the crania. The individual crania are distinguished in this description by the letters A to N inclusive.[1]

Several of the crania had the appearance of having been exposed to the weather, as the outer table was peeling off in thin flakes, and the bones were greenish and discoloured. The majority of the crania were smeared with a red pigment, usually without any pattern, but in two specimens A and M, a red band had been drawn around each orbit, and vertical lines on the frontal bone.

The orbits in the skull D were each filled with a black hardened mass, in the centre of which was a valve of a bivalve shell to represent the eye. A similar black material had been used to fill up the hollow at the base of the skull, between the foramen magnum

[1] By the permission of the Lords Commissioners of H.M. Treasury I exhibited and described these crania at the International Medical Congress in London, August, 1881. An abstract of my communication was published in the *Transactions of the Congress*, vol. i. p. 146, Anatomical section, and in the *Journ. Anat. and Phys.*, vol. xvi. p. 135.

and the posterior nares. The nasal fossæ were also occupied by it, and it had been employed to model an artificial nose of a low aquiline form.[1] In seven of the crania a hole had been knocked through the squamous part of each temporal bone, and in two of the specimens a piece of cane had been passed through the holes for the purpose of suspending the skulls. Prof. Moseley states that it is a common practice to stick in the thatch of the houses the skulls of animals and of man. He states that—

"At D'Entrecasteaux Island one having an ornament in the nose was suspended to the front of a house over the doorway, by means of a stick thrust through holes in the two squamous parts of the temporal bone. This skull the owner could not be induced to part with, but usually they were sold pretty freely, and they were in considerable abundance about the houses, but often much shattered. A dozen only were purchased."[2]

In each skull, with one exception, one or both zygomatic arches had been broken, sometimes so much that the greatest zygomatic diameter could not be measured. Two of the crania were tied together by a piece of split cane passed through the sphenomaxillary fissure in the wall of the orbit. The cranial characters were those of persons who had reached adult life, and in two specimens were inclining to a more advanced age. Some of the skulls were undoubtedly males, others females. But it was difficult to decide to which of the two sexes others of the crania had belonged. I have, however, arranged them in two groups, and am disposed to regard seven as males and five as females. The skulls are not large or heavy, and they do not give one the impression of belonging to a people either of big stature or great muscular development, which is in accordance with Prof. Moseley's measurements of height and weight (p. 52).

Norma verticalis.—The crania showed many features in common. They were elongated antero-posteriorly. They were neither flattened nor ridge-shaped at the vertex, but had a gentle curve across the vertex from one parietal eminence to the other. Below the parietal eminences, the sides of the skull approached the vertical, although in the majority of the crania the transverse diameter was a little greater near the squamous suture than at the parietal eminences. In two specimens the stephanic and asterionic diameters were equal, in three the stephanic exceeded the asterionic, in seven the asterionic exceeded the stephanic. Only two specimens were phænozygous, and these but slightly.

Norma lateralis.—Some of the crania rested behind on the conceptacula, others on the mastoid processes and only one on the occipital condyles. With two exceptions the

[1] I may refer to my paper on Two Masks and a Skull from Islands near New Guinea, in *Journ. Anat. and Phys.*, vol. xiv. July 1880, for an account of a number of methods of decorating and preserving the crania or heads of the dead in use amongst the Aborigines of the Malayo-Polynesian Archipelago.

[2] In a recent letter to me Prof. Moseley states :—"from what is now known, it is most probable that the crania obtained from the roofs of the houses were those of persons who were eaten by Admiralty Islanders; their skulls being set up as trophies of the feast, and, according to Miklucho-Maclay, to be used as a kind of chronological record. The skulls collected were probably those of inhabitants of the main island of the Admiralty group caught alive, or bought or killed for food. But if, as is barely possible, the Admiralty Islanders have any intercourse occasionally with neighbouring groups the victims may have come from thence."

glabella and supraciliary ridges were feeble, so much so indeed that the difference between the glabello-occipital and ophryo-occipital diameters in no instance exceeded 2 mm., and usually was not more than 1 mm. The forehead was not retreating. The profile outline of the crania through the upper frontal, parietal, and occipital regions, formed a continuous curve. In all, the most projecting part of the occiput was in the occipital squama above the occipital protuberance. Some of the crania showed a slight flattening in the hinder parietal region; this flattened part was not however vertical, but inclined downwards and backwards to form a curve with the superior occipital squama, so that it did not resemble the flattening produced in the parieto-occipital region in skulls subjected to artificial compression during infancy. In the crania generally the cerebellar fossæ in the occipital bone had no great bulging, and in two specimens this part of the bone was almost flat on its inferior aspect. In K the occipital region was unsymmetrical, for the left side of the bone projected further back than the right. In all except one specimen the frontal longitudinal arc exceeded the occipital. In all except one skull the parietal arc exceeded the frontal, and in all the parietal was greater than the occipital.

The nasal bones were neither large nor very prominent; they varied in length from 15 to 26 mm. and in greatest breadth from 5 to 10 mm. They curved downwards and forwards, so that the osseous bridge of the nose was shallow and concave; but owing to the feeble glabella the naso-frontal suture was not deeply depressed. The interzygomatic exceeded the stephanic, asterionic, and intermalar diameters in all the skulls where the zygomata were so uninjured as to permit that diameter to be measured, but the interzygomatic diameter with one exception (B) was less than the greatest breadth in the parieto-squamous region. In several instances the intermalar breadth was greater than either the stephanic or asterionic. The mean interorbital breadth was 21·7 mm., the maximum in two instances being 26 mm., the minimum in one specimen 18 mm.

In all the specimens except H and K the teeth were fully erupted, but in the majority of the crania the teeth had dropped out of the alveoli, obviously before the skulls were collected. The teeth which remained were either bicuspids or molars, and the grinding surfaces of the crowns were not as a rule much worn down. The incisors were not in place in any one of the skulls, although their sockets were unabsorbed. None of the teeth showed any evidence of decay. G was the only skull in which a canine tooth was present; it was worn almost to a stump, and the sockets of the molars were in process of absorption. In H the sockets of the upper canines and wisdom teeth were absorbed.[1]

The cranial sutures were as a rule simple in their denticulations, and this simplicity

[1] None of the crania exhibited that very remarkable magnitude of the incisor teeth which Miklucho-Maclay has described in some natives of the Admiralty Islands and of Hermit Island. The upper incisors in these persons projected downwards and forwards so as to appear between the lips. In one case, which he measured, the crown of an incisor tooth was 22 mm. long, 19 broad, and 11 mm. thick. The women showed this peculiarity less frequently than the men. See Verhandl. der Berlin Gesellschaft für Anthrop., 16 Dec. 1876, in *Zeitschr. für Ethnol.*, Bd. viii., 1876.

was especially marked in the upper half or so of the coronal suture, and in the more anterior part of the sagittal. In only two specimens, C and G, were the sutures beginning to disappear from senile changes, and in C the molars showed more than in any other skull the effects of use on the crowns. In all, the basi-cranial synchondrosis was ossified. No skull was metopic. In each of the two lower jaws the coronoid process was feeble and the sigmoid notch was shallow. In one the chin was feeble, in the other it was more massive, rounded at its lower border and projected forwards.

In E and I a broad tongue-like process of the squamous temporal was interposed between the left ali-sphenoid and the antero-inferior angle of the parietal. An epipteric bone was situated on the right side of E, between the ali-sphenoid and parietal, and two large epipterics were placed in K between the left ali-sphenoid and parietal. On the right side of D a single epipteric was situated in the spheno-parieto-frontal suture, but it did not entirely cut off the ali-sphenoid from the parietal. H had a similar bone in the spheno-parietal suture. In the other skulls the pterion was normal, though in G the spheno-parietal articulation was very small. One or more Wormian bones were present in the lambdoidal suture in A, B, D, E, F, H, and K; in the last of which they were large and infringed considerably on the area of the parietal bones. In H a small triquetral bone was in the sphenoido-frontal suture.

The male skull K exhibited a rare and interesting irregularity in the ossification of the cranial bones; for in it the right parietal was completely but unequally separated into an upper and a lower division by an antero-posterior suture, situated in the position of the temporal ridge, and extending from the coronal to the lambdoidal suture. This suture was much denticulated, and had an os triquetrum in its posterior third. The vertical diameter of the upper division of this parietal bone, midway between the coronal and the lambdoidal sutures, was 81 millimetres, and of the lower division only 42 mm. A large Wormian bone in the lambdoidal suture infringed upon the posterior part of the upper division. The left temporal ridge of the same skull was well marked, and in proximity both to its anterior and posterior ends was a faint appearance of a suture as if the left parietal also had been separated into an upper and a lower division at an earlier period of life. In the course of my anatomical experience, during which many hundreds of human crania have passed through my hands, I have only seen one other specimen in which a similar division of the parietal bone occurred, and this was in the right parietal of a fœtus, between the eighth and ninth month, dissected by Dr. Ramsay H. Traquair, who described it in the Natural History Review.[1]

Cases of division of the parietal have, however, from time to time been recorded by other anatomists. Winslow[2] and von Doeveren[3] had each in their possession in the last century, and von Sömmerring[4] described in the earlier part of the present century, a

[1] 1863, vol. iii. p. 132.

[2] See Tarin's Osteographie, Paris, 1753.

[3] Specimen Observ. Acad. Groningæ, 1765, quoted by Wenzel Gruber.

[4] Tiedemann and Treviranus's *Zeitschrift für Physiologie*, s. I., Tafel I., 1826.

skull in which one or both parietals had been divided by an antero-posterior suture into an upper and a lower part. In Winslow's and von Sömmerring's cases the crania were adults, in von Doeveren's the skull was that of a child. Wenzel Gruber described[1] the skull of a male fœtus in which, along with other malformations, the left parietal was divided into an upper and a lower portion; also the cranium of an adult in which the posterior and lower part of the left parietal was a separate piece: in 1870 he described and figured[2] a right parietal in a youth as divided into two parts by a suture extending diagonally from the anterior end of the sagittal suture to about the middle of the lambdoidal: in 1876 he described and figured[3] an adult male skull, in which the postero-inferior angle of the parietal, with the part of the bone for some distance above it, was separated from the rest by a suture extending from the squamous to the lambdoidal suture: in 1879 he described[4] three other adult crania; in one the posterior and lower part of the left parietal was separate from the rest of the bone by a suture extending from the squamous to near the apex of the lambdoidal suture, in a second each parietal was divided by a suture extending forwards from the lambdoidal through the lower part of the bone, in the third the right parietal was divided by a suture passing from the lower end of the coronal to about the middle of the lambdoidal suture. Lucæ[5] and Welcker[6] have each described a skull with the parietal divided by an antero-posterior fissure into an upper and a lower part. Hyrtl has also figured[7] the skull of an adult and those of three fœtuses in which a similar division of the bone was met with.[8]

In all the specimens the os planum of the ethmoid was small, and wherever it was uninjured, so that its shape could be determined, it was quadrilateral in form, although in Z its anterior border was elongated forwards and not vertical. In D, F, H, and L, remains of the maxillo-premaxillary suture were visible on the surface of the hard palate. Only in C had the hard palate any great depth, being 16 mm. in that skull opposite the second molar tooth. In five crania a suture extended from the infraorbital foramen through the lower border of the orbit into the floor of the orbit and the infraorbital canal.

In E the nasal bones had apparently not been developed. The nasal spine of the frontal bone appeared on the surface of the osseous bridge of the nose, immediately below the glabella, and descended between the ascending processes of the superior maxillæ. Below the free end of this spine the ascending processes of the superior maxillæ articulated with each other mesially for about $\frac{2}{10}$ths of an inch. In the same skull a distinct

[1] Abhandl. a. d. mensch. u. vergl. Anatomie, 1852; also *Mém. de l'Acad. Imp. de St. Petersbourg*, ser. 7, t. ii., 1859.

[2] *Virchow's Archiv*, Bd. l., p. 113, 1870.

[3] *Virchow's Archiv*, Bd. lxvi., p. 468, 1876.

[4] Beobachtungen aus der menschlichen und vergleichenden Anatomie, Heft ii. p. 12, e.s. pl. iii., Berlin 1879.

[5] Zur Architectur d. Menschenschädels, 1857.

[6] Untersuch. ü. Wachsthum u. Bau des mensch. Schädels, 1862.

[7] Die doppelten Schläfelinien der Menschen-schädel, *Denkschr. d. k. Akad. d. Wiss. Wien.* 1871.

[8] At the meeting of the Anatomical Section of the International Medical Congress, at which I exhibited and described the Admiralty Island crania, I understood Prof. von Kölliker to say that a similar skull was in the Museum of the University of Würzburg.

shallow concave articular facet (third condyle) for the odontoid process of the axis was situated on the anterior border of the foramen magnum.[1] The lateral condyles of the occipital bone did not, however, exhibit a degree of flattening such as is sometimes seen associated with the presence of a third occipital condyle ; they were indeed more convex than in others of the crania in which no third condyle was present.

In all the crania the nasal spine of the superior maxillæ was distinctly marked, and the floor of the anterior entrance into the nose formed almost a right angle with the lateral boundary, and was not rounded off, except in L, in which there was marked prognathism of the upper jaw, and the alveoli of the upper incisors projected forward.

The mean cephalic index of twelve crania was 70. That of the seven probable males

TABLE VIII.—ADMIRALTY ISLANDERS, CHAL.

	Collection,	A.	C.	D.	E.	F.	K.	N.	B.	G.	H.	I.	L.	M.
	Age,	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.
	Sex,	M.	M.	M.?	M.	M.?	M.	M.	F.	F.	F.?	F.	F.	Face.
	Cubic capacity,	1528	1292	1252	1353	1410	1430	...	1068	1257	1220	1187	1140	...
	Glabello-occipital length,	185	184	176	186	186	185	184	170	185	178	179	177	...
	Ophryo-occipital ,,	184	183	174	186	185	185	182	169	184	177	180	176	...
	Basi-bregmatic height,	144	131	133	138	138	132	132	124	120	127	130	122	...
	Vertical Index,	*77*	*71*	*75*	*74*	*74*	*71*	*72*	*72*	*64*	*71*	*72*	*69*	...
	Minimum frontal diameter,	90	88	90	97	99	95	100	86	92	86	88	89	91
	Stephanic, ,, ,,	112	105	102	103	110	112	114	100	104	98	94	99	...
	Asterionic, ,, ,,	116	106	98	108	110	112	108	91	118	108	102	102	...
	Greatest parietal breadth,	130*s*	132*s*	129*s*	129*p*	133*s*	130*s*	134*s*	120*s*	125*s*	126*s*	124*p*	121*s*	...
	Cephalic Index,	*70*	*72*	*73*	*69*	*71*	*70*	*73*	*70*	*67·5*	*70*	*69*	*68*	...
	Horizontal circumference,	520	515	490	515	517	517	516	480	510	493	490	485	...
	Frontal longitudinal arc,	140	126	115	136	139	120	127	120	120	117	124	114	116
	Parietal ,, ,,	150	148	137	148	130	150	134	124	133	128	134	130	...
	Occipital ,, ,,	114	...	114	110	127	121	115	110	115	108	118	108	...
	Total ,, ,,	404	...	366	394	396	391	376	354	368	353	376	352	...
	Vertical transverse arc,	320	295	288	301	311	312	...	270	276	283	285	275	...
	Length of foramen magnum,	31	...	28	30	33	33	29	28	33	30	31	34	...
	Basi-nasal length,	100	96	99	95	102	96		96	99	99	100	90	...
	Basi-alveolar length,	98	99	102	102	106	99		92	106	100	98	103	...
	Gnathic Index,	*98*	*103*	*103*	*107*	*103*	*103*		*96*	*107*	*101*	*98*	*114*	...
	Interzygomatic breadth,	...	126	127	128	...	...		128	122	...	119	...	...
	Intermalar ,,	112·5	108	109	112	110	116		110	104	108	110	101	113
	Ophryo-alveolar length,	89	84	77	76	75	91		77	88	84	87	80	92
	Naso-alveolar ,,	68	65	62	56	58	72		60	68	66	64	61	70
	Facial Index,	...	*66*	*61*	*59*	...	...		*60*	*72*	...	*73*	...	...
	Nasal height,	51	48	...	45	46	54		51	56	57	47	49	52
	Nasal width,	24	26	...	25	25	22		22	25	22	21	25	28
	Nasal Index,	*47*	*54*	...	*55*	*54*	*41*		*41*	*44*	*38*	*45*	*51*	*54*
	Orbital width,	38	37	39	37	37	39		35	37	38	39	33	39
	Orbital height,	36	29	33	31	30	38		28	32	30	34	32	32
	Orbital Index,	*95*	*78*	*84*	*83*	*81*	*97*		*80*	*86*	*79*	*87*	*97*	*82*
	Palato-maxillary length,	53	59	54	57	56	55		51	58	51	54	59	...
	Palato-maxillary breadth,	60	62	64	63	61	65		59	62	62	56	63	...
	Palato-maxillary Index,	*113*	*105*	*118*	*110*	*109*	*118*		*115*	*107*	*121*	*104*	*107*	...
Lower Jaw.	Symphysial height,	...	...	...	...	...	...		...	...	27	...	...	29
	Coronoid ,,	...	...	...	...	..	...		...	...	62	...	...	50
	Condyloid ,,	...	...	...	...	...	...		...	...	64	...	...	54
	Gonio-symphysial length,	...	...	...	...	...	...		...	...	93	...	...	86
	Inter-gonial width,	...	...	...	...	...	...		...	...	80	...	...	79
	Breadth of ascending ramus,	...	...	...	...	...	...		...	...	...	...	..	...

Calvaria only.

[1] The changes which lead to the formation of a third condyle in this region have been discussed by the late Prof. Halbertsma, De derde Gewrichtsknobbel, 1865, abstracted by Dr. Barnard Davis in an article on Dutch Anthropology in the *Anthropological Review*, vol. iii. 1865, and by Dr. Wm. Allen in *Journ. Anat. and Phys.*, vol. xv. p. 60, 1881.

was 71; of the five probable females 69. The maximum cephalic index in two of the crania (males) was 73; the minimum in one (female) 67·5. The skulls were therefore markedly dolichocephalic, for not a single specimen had a mesaticephalic, and still less a brachycephalic index.

The mean vertical index of twelve crania was 72; that of the males was 73, of the females 70. The mean of the whole series and of the males was metriocephalic, that of the females tapeinocephalic. The maximum vertical index in one (male) was 77, the minimum in one (female) was 64. The mean height in relation to the length was somewhat greater than the mean breadth; a result which was due to the greater vertical diameter of the male crania. For the mean basi-bregmatic height of seven males was 135 mm.; the maximum being 144, the minimum 131 mm. The mean corresponding height of five females was only 125 mm.; the maximum being 130, the minimum 125 mm. In the males the height exceeded the greatest breadth in five cases, but in two the breadth very slightly exceeded the height. In the females the height was slightly in excess of the breadth in four cases, whilst the breadth somewhat exceeded the height in one.

Owing to the broken zygomatic processes in several of the crania, the bizygomatic diameter could only be taken in six specimens, and consequently in these only could the proportion of the breadth to the ophryo-alveolar length be measured, and a facial index be obtained. The mean facial index was 65; that of three males 62, and three females 68. The maximum facial index in one (female) was 73, the maximum in one (male) 59.

The mean gnathic index of eleven crania was 103, and this general average was alike in the two sexes. The maximum gnathic index in one skull (female) was 114; the minimum in one (female) 96. If we take 103 as marking the lowest term of prognathism, then four of the crania reached this index, and only three exceeded it; whilst three skulls ranged from 98 to 101, and one was below 98. Hence it may be said that one was orthognathous, three were mesognathous, four were at the lowest term of prognathism, and only three were decidedly prognathic. The mean average of the series was on the line between mesognathism and prognathism. The basi-nasal length was greater than the basi-alveolar in three crania, *i.e.*, in those in which the gnathic index was below 100.

The mean nasal index of eleven crania was 48; that of six males was 51, that of five females was 44. The maximum nasal index in one skull (male) was 55; the minimum in one skull (female) was 38. Four of the skulls, and these all males, were platyrhine, one, a female, was mesorhine, and the remaining six were leptorhine. The mean average was on the line between the leptorhine and mesorhine.

The mean orbital index of twelve crania was 86; and this index was alike in the two sexes. The maximum orbital index was 97 in both a male and a female, the minimum was 78 (male). Both in the males and females the mean orbital index was mesoseme, although in two males and one female it rose to megaseme, and in four males and two females it sunk to microseme.

The mean palato-maxillary index of eleven crania was 112, and this index was practically the same in the two sexes. The maximum palato-maxillary index was 121 (female), the minimum was 104, also a female. The palate exhibited, therefore, as a rule, no great disproportion between its breadth and its length, it was mesuranic, and like the crania of the Fiji Islanders measured by Prof. Flower, was in its form rather intermediate between the parabolic and the hypsiloid.

As seven of the crania had holes in the squamous temporals, and one other was slightly imperfect near the foramen magnum, the cubic capacities could only be estimated approximately. The mean capacity of eleven crania was 1285 cubic centimetres.[1] That of six males was 1377·5, that of five females was 1154. The maximum cranial capacity in one (male) was 1528; the minimum in one (female) was 1068. Only one skull classified as female exceeded in capacity the lowest of the skulls classified as males. This classification was based upon the general characters of the skulls, and not upon their capacities. If we take 1350 cubic centimetres as the lowest limit of mesocephalism, then four of the eleven skulls exceeded it, and these were probably male skulls. Of these four, one was megacephalic, and three were mesocephalic. The two remaining male skulls were microcephalic. The male crania, therefore, may be regarded as in the average mesocephalic in capacity, the female as microcephalic; and the general average capacity of the series was microcephalic. The ratio between the sexes is as 100 to 84, which is a low average for the female.[2]

To summarise the conclusions now arrived at from the analysis of the table of measurements, I may state that the crania of the Admiralty Islanders are distinctly dolichocephalic; on the line between tapeinocephalic and metriocephalic; cryptozygous; on the line between mesognathism and prognathism; on the line between the leptor-

[1] These figures of the cubic capacity differ somewhat from those printed in the abstract in the *Trans. Inter. Med. Congr.*, for the measurements I had made at that time were with sand, whereas those now given have been taken with shot in the manner described in the introduction to this Report.

[2] In the collection was another skull, marked in Prof. Moseley's handwriting, "Admiralty Islander?" In a letter to me, Mr. Moseley states that he found the skull unlabelled in one of the cupboards of the laboratory on the Challenger, but could get no one to identify it with certainty. From various circumstances he was disposed to think that it came from the Admiralty Islands, and wrote therefore upon it, but with a query. Owing to the uncertainty as to where it came from, and from the differences between it and the skulls which undoubtedly came from one of those islands, I have not included it in the description. The length of the cranium was 178 mm., its greatest breadth was 142 mm.; its basi-bregmatic height 135 mm. It was not only absolutely shorter than the greater number of the Admiralty Island skulls described above, but it was very much wider than even the widest of them, so that its cephalic index was 80. Its vertical index was 76, which places it considerably above the mean of the other crania. The gnathic index was 100; the palato-maxillary index was 126, the palate being distinguished by its great width in relation to its length. This skull had a very different appearance from those above described. Its great width gave it the rounded brachycephalic form. Its interzygomatic breadth was 140 mm., which gave a breadth to the face much in excess of the widest face amongst the above crania. No pigment had been smeared over the bones. If they were natives of the Admiralty Islands I have no hesitation in saying that this skull did not belong to the same race, so that if it were collected on Wild Island, it was a representative of a different people from those whose crania are described in the text. As they were the rule and it the exception, it was, granting the accuracy of its place of collection, probably an imported specimen, not unlikely a brachycephalic brown Polynesian.

hine and mesorhine as regards the nasal index; mesoseme as regards the orbital index, mesuranic as to the length and breadth of the palato-maxillary arch; microcephalic for the females, but mesocephalic for the males.

SANDWICH ISLANDERS.

Plates V., VI. Tables IX., X., XI., XII., XVIII., XIX.

These crania were from two different islands in the group, viz., Hawaii and Oahu. Four skulls were presented by W. L. Green, Esq., the foreign minister to the King of the Sandwich Islands, who took them from a cave on Waimea Plains, Hawaii, near the Hill of Holohaloku. Mr. Green, in a letter to Sir Wyville Thomson, states that "this cave is an ancient burial place, and that it contains the remains of dozens of skeletons. Some of the bodies are mummified, and implements are also found. Some years ago a drunken white set fire to the place, and there are bushels of charred bones there. Some of these skulls sent shew marks of the fire. I have sent some eighty skulls to Dr. J. Barnard Davis, who has them all gauged and catalogued."

The other crania, thirty-three in number, some of which were accompanied by other bones of the skeleton, were contained in boxes labelled "Kanakas from Oahu, Sandwich Islands, 15 miles from Honolulu." These skulls are referred to by Prof. H. N. Moseley, in his Notes by a Naturalist on the Challenger,[1] in the following paragraphs:—

"Whilst the ship was at Honolulu, I visited the north-east side of the island and collected at Waimanalo, on the estate of Mr. John Cumming, a series of native skulls from a deserted burial-place. The burials are amongst dunes of calcareous sand, and the bones are exposed by the shifting of the sands by the wind. The burials are often on the sides of the gullies between the dunes. They have probably been made in this locality because of the ease with which the sand is excavated. Similar burials occur at various spots around the coast of Oahu, and I know of no place where so abundant material is ready at hand for the study of the skeletal peculiarities of a savage race, by the examination of long series of crania and skeletons, as here. Other burials occur in caves inland, where the bodies are found in a dried mummy-like condition.

"All the bodies at Waimanalo were buried in a doubled-up posture. One which was exhumed with care *in situ*, was buried with the knees bent up to the chest and the head bent forwards, and was placed resting horizontally on the back. Chips and fragments of basalt were found around all the graves, but no implements of stone."

Hawaii.—As the four crania from Waimea, Hawaii, possessed a strong family resemblance to each other, I shall in the first instance describe their characters. They were all adults, and apparently males.

Norma verticalis.—Broad-headed, parietal tubera prominent. They were scarcely ridged in the sagittal region; the sides of the cranium were almost vertical below the

[1] London, 1879.

tubera. They were slightly phænozygous. The stephanic diameter was in all in excess of the asterionic, and the greatest breadth was in two cases in the parietal, in the others in the squamous regions.

Norma lateralis.—The skulls rested behind on the mastoids or on the occipital condyles. The glabella and supraciliary ridges were not especially prominent, except in one specimen; the frontal profile did not recede greatly from the glabella. The skulls were somewhat flattened behind, in the region of the obelion and occipital squama, and there was a rapid downward slope from the obelion to the inion, and with a comparatively slight projection of the occipital squama behind the inion, characters which are so marked in brachycephalic skulls. It is possible that the flattening had been assisted by artificial pressure applied during infancy. In three of the specimens there was a slight obliquity in the occipital region, as if the pressure had not been symmetrical. The frontal longitudinal arc was always in excess of the parietal, and the parietal, except in one specimen, was in excess of the occipital. The cerebellar part of the occipital bone was not horizontal, but sloped upwards and backwards to the protuberance and superior curved line; the conceptacula cerebelli had no especial bulging. The foramen magnum was always longer than wide: the maximum length was 35 mm., and the width in the same skull was 29 mm.

The bridge of the nose was slightly concavo-convex and not very prominent. The nasal bones varied in length from 22 to 25 mm. and in width from 8 to 12 mm. The nasal spine of the superior maxillæ was distinct but not strong. The junction of the side wall with the floor of the anterior nares was slightly rounded. In the skull with strong supraciliary ridges the external angular processes were prominent, and the temporal ridges were strong. The interzygomatic breadth considerably exceeded the intermalar, stephanic, and asterionic, and the intermalar breadth in each case was somewhat greater than the stephanic and considerably more than the asterionic; but the interzygomatic was less than the greatest transverse diameter. The mean interorbital breadth was 25·5, the maximum 28, the minimum 23. In A the length of the face was from the ophryon to the chin 135 mm., from the fronto-nasal suture to the chin 112 mm. In B the corresponding dimensions were respectively 126 and 108 mm.

The teeth in all were fully erupted, except in one, in which the wisdoms were not present; the teeth were not much worn, and there was no decay. The sutures were sometimes simple, at others more denticulated and not obliterated from age. No Wormian bones were in the lambdoidal suture. One skull had a triquetral bone in the left pterion and two in the right. In A the squamous temporal articulated with the frontal in the right pterion. The os planum was normal except on the left side of B, in which a small triquetral intervened between its upper half and the lachrymal. No skull was metopic, and there was no division of the malar bone. In one the maxillo-premaxillary suture was faintly indicated on the palate. In C an elongated ivory exostosis projected from the posterior wall of each auditory meatus outwards to the orifice. In D a large

paramastoid depended from the right jugal process of the occipital. In A a small third condylar surface was at the front of the foramen magnum, but without marked flattening of the occipital condyles. Both in A and D a suture extended through the infraorbital foramen into the floor of the orbit.

A and B had lower jaws, not very massive and with no great development of chin.

TABLE IX.—WAIMEA PLAINS, HAWAII, SANDWICH ISLANDS, CHAL.

Brachycephali.

		A.	B.	C.	D.
	Collection,	A.	B.	C.	D.
	Age,	Ad.	23	Ad.	Ad.
	Sex,	M.	M.	M.	M.
	Cubic capacity,	1338	1635	1420	1328
	Glabello-occipital length,	169	178	176	173
	Ophryo-occipital „	167	174	172	170
	Basi-bregmatic height,	142	143	142	138
	Vertical Index,	*84*	*80*	*81*	*80*
	Minimum frontal diameter,	90	102	98	95
	Stephanic, „ „	112	118	123	110
	Asterionic, „ „	101	113	108	104
	Greatest breadth,	142*p*	148*s*	146*s*	148*p*
	Cephalic Index,	*84*	*83*	*83*	*85*
	Horizontal circumference,	492	523	510	510
	Frontal longitudinal arc,	122	131	132	126
	Parietal „ „	119	130	122	118
	Occipital „ „	109	119	106	121
	Total „ „	350	380	360	365
	Vertical transverse arc,	310	323	325	312
	Length of foramen magnum,	30	35	33	31
	Basi-nasal length,	107	102	108	102
	Basi-alveolar length,	106	100	100	96
	Gnathic Index,	*99*	*99*	*92*	*94*
	Interzygomatic breadth,	136	144	143	130
	Intermalar „	122	122	125	120
	Ophryo-alveolar length,	85	85	92	90
	Naso-alveolar „	64	64	71	64
	Facial Index,	*62*	*59*	*64*	*69*
	Nasal height,	48	50	56	51
	Nasal width,	23	26	26	21
	Nasal Index,	*48*	*52*	*46*	*41*
	Orbital width,	37	38	36	36
	Orbital height,	34	37	36	36
	Orbital Index,	*92*	*97*	*100*	*100*
	Palato-maxillary length,	57	54	56	54
	Palato-maxillary breadth,	62	64	67	63
	Palato-maxillary Index,	*109*	*118*	*119*	*116*
Lower Jaw.	Symphysial height,	30	24	...	...
	Coronoid „	69	67	...	...
	Condyloid „	71	57	...	...
	Gonio-symphysial length,	91	93	...	...
	Intergonial width,	95	104	...	...
	Breadth of ascending ramus,	39	41	...	...

The sigmoid notch in A was very shallow, in B a little deeper. The gonio-symphysial length in both was less than the intergonial width.

The mean cephalic index was 84, and the range of variation from 83 to 85 was only 2. The skulls were therefore all decidedly brachycephalic. The mean vertical index was 81, and the range of variation from 80 to 84, was only 4. The mean basi-bregmatic height was below the mean breadth, and in only one specimen were these dimensions equal. The skulls were decidedly akrocephalic. The mean gnathic index was 96, and the range from 92 to 99 was 7. Two were orthognathic and two mesognathic. The mean facial index was 74·5 and the range from 71 to 77 was 6. The mean nasal index was 47, and the range from 41 to 52 was 11. Two were mesorhine, two leptorhine. The mean orbital index was 97, and the range from 92 to 100 was 8. They were all megaseme. The mean palato-maxillary index was 115, and the range from 109 to 119 was 10. The average cubic capacity was 1430 c.c. ; the maximum 1635 c.c., the minimum 1328 c.c. ; the skulls therefore were in the mean mesocephalic.

These skulls from Waimea were in their average proportions brachycephalic, akrocephalic, phænozygous, either orthognathic or mesognathic, leptorhine or mesorhine, megaseme, on the verge of brachyuranic and mesocephalic.

Oahu.—The skulls and accompanying bones of the skeleton from Oahu were with few exceptions bleached perfectly white from exposure, those not white were light brown, and had without doubt been concealed in the sand.

Two distinct types of skulls were found in the series ; the one definitely brachycephalic, the other as distinctly dolichocephalic, whilst a third set were intermediate in the form and proportions of the cranium.

The brachycephalic crania were seven in number, and are distinguished in the accompanying table by the letters I, K, S, V, Aa., Ac., Ah. They were all adults, with the exception of Ah. Judging from the dentition, Ah. was a child of 8 or 9, probably a boy ; the milk molars and the first true molar were in place, but the second true molar and canines had not erupted. Four of the adults were evidently males, two females, and one of the latter was accompanied by the pelvis and other bones of the skeleton. I compared these adult skulls with the series of four brachycephali from a cave on Waimea Plains above described, and I found that the general configuration of the cranium was so much alike in both series, that no special description of these specimens from Oahu seems to be necessary, though it should be stated that the skulls from Oahu were cryptozygous. In each skull the frontal arc and the parietal arc exceeded the occipital. In four skulls the frontal and parietal arcs were almost or quite equal to each other ; in two the frontal arc considerably exceeded the parietal ; in one the parietal exceeded the frontal. In each skull the stephanic diameter was greater than the asterionic. In the males the greatest parietal diameter was nearer the parietal eminence than the

squamous suture, in the females and child the reverse was the case. The interzygomatic diameter was considerably below the interparietal. The mean interorbital diameter was 23·5, the maximum 26, the minimum 21. The bridge of the nose was slightly concavo-convex, the nasal bones varied in length from 21 to 25, and in greatest breadth from

TABLE X.—OAHU, SANDWICH ISLANDS, CHAL.

Brachycephali.

	Collection,	K.	S.	V.	Aa.	I*.	Ac.	Ah.
	Age,	Ad.	Ad.	Ad.	21	Ad.	Ad.	Æt. 8
	Sex,	M.	M.	M.	M.	F.	F.	M?
	Cubic capacity,	1398	1675	1535	1430	1345	1495	1508
	Glabello-occipital length,	176	184	182	174	175	178	164
	Ophryo-occipital „	174	180	179	174	174	176	165
	Basi-bregmatic height,	140	144	142	141	136	140	132
	Vertical Index,	*79*	*78*	*78*	*81*	*78*	*78*	*80*
	Minimum frontal diameter,	96	98	97	92	94	88	92
	Stephanic, „ „	121	126	115	112	112	115	117
	Asterionic, „ „	102	116	110	105	105	102	114
	Greatest breadth,	146*p*	155*p*	148*p*	150*p*	146*s*	146*s*	152*s*
	Cephalic Index,	*83*	*84*	*81*	*86*	*83*	*82*	*92*
	Horizontal circumference,	506	541	523	504	512	506	499
	Frontal longitudinal arc,	126	140	128	128	125	127	124
	Parietal „ „	136	107	124	128	125	126	117
	Occipital „ „	112	...	118	105	120	118	109
	Total „ „	374	...	370	361	370	371	350
	Vertical transverse arc,	313	338	325	333	310	318	328
	Length of foramen magnum,	29	...	36	35	32	32	34
	Basi-nasal length,	100	108	110	...	100	104	89
	Basi-alveolar length,	97	...	110	...	102	104	88
	Gnathic Index,	*97*	...	*100*	...	*102*	*100*	*99*
	Interzygomatic breadth,	129	142	138	...	126	129	119
	Intermalar „	115	124	119	...	110	110	108
	Ophryo-alveolar length,	88	...	89	...	85	86	73
	Naso-alveolar „	69	...	66	...	63	63	57
	Facial Index,	*68*	...	*64*	...	*67*	*67*	*61*
	Nasal height,	48	...	51	...	47	50	42
	Nasal width,	22	...	23	...	27	24	20
	Nasal Index,	*46*	...	*45*	...	*57*	*48*	*47*
	Orbital width,	37	38	39	...	36	36	34
	Orbital height,	35	35	31	...	33	37	33
	Orbital Index,	*95*	*92*	*79·5*	...	*92*	*103*	*97*
	Palato-maxillary length,	53	...	58	...	55	54	45
	Palato-maxillary breadth,	...	...	65	...	66	...	59
	Palato-maxillary Index,	...	...	*112*	...	*124*	...	*131*
Lower Jaw.	Symphysial height,	26	...	...	...	28	...	...
	Coronoid „	64	...	...	...	60	...	...
	Condyloid „	62	...	...	...	53	...	...
	Gonio-symphysial length,	86	...	...	...	88	...	...
	Intergonial width,	89	...	...	...	86	...	...
	Breadth of ascending ramus,	33	...	...	...	35	...	...

* With pelvis.

6 to 10 mm. S and V had each a small exostosis in the roof of the right auditory meatus. Ah. had a triquetral bone in each pterion and V one in the left pterion. On the right side of I was a large spheno-pterygoid foramen, due to the development of a plate of bone between the external pterygoid process and the spine of the sphenoid; on the left side the foramen was not quite complete. No skull was metopic. In K, V, and Ac., a suture extended from the infraorbital foramen into the floor of the orbit and infraorbital canal.

In the two lower jaws the sigmoid notch was shallow, and the coronoid process was on the whole feeble. The chin was fairly marked. The gonio-symphysial and intergonial diameters were nearly equal. The child's skull being excluded, the mean cephalic index was 83. The adults ranged in the cephalic index from 81 to 86, but the child had an index of 92. The mean vertical index was 79, which places them in the akrocephalic series, though not so high as the Waimea skulls. The somewhat smaller average of the vertical index was probably due to two of the adult crania from Oahu being females. The mean gnathic index was 100, somewhat higher, therefore, than those from Waimea, so that they were with one exception mesognathous. Owing to the nasal index of the female skull I being as high as 57, the mean was raised to 49, so that the average was mesorhine. The mean orbital index of the adults was 92, and they were all megaseme except V, which was microseme. In only two of the adults could the palate be measured, and the mean palato-maxillary index of these specimens was 118. The mean cubic capacity of the set of seven skulls was 1484 c.c.; that of four adult males was 1509·5 c.c., of two adult females 1420 c.c.; the males were megacephalic, the females mesocephalic. This group of Sandwich Islanders was in their mean proportions brachycephalic, akrocephalic, cryptozygous, mesognathic, mesorhine, megaseme, brachyuranic, and mesocephalic.

Fifteen of the crania from Oahu had the cephalic index below 75 and were all distinctly dolichocephalic. They were all adults. Eight were presumably males and seven females, and of the latter three were accompanied by the pelvis and other bones of the skeleton.

Norma verticalis.—Sagittal line was ridged, the parietal eminences were prominent, and the roof of the skull had a ridge-shaped and "ill filled" appearance. The cranium was both more elongated and narrower than in the brachycephali. The greatest parietal breadth, both in the males and females, was sometimes near the parietal eminence, at others near the squamous suture. As distinguished from the brachycephalic skulls, in only one instance did the greatest parietal diameter exceed 140 mm., viz., in Y, in which it was 142 mm., whilst in the two groups of brachycephali in only one instance was it as small as 142 mm., and in three specimens it reached 150 mm. or upwards. On the other hand, in the dolichocephali the glabello-occipital diameter fell in only one instance below 180 mm. (viz. in A to 175 mm.), whilst in three specimens it exceeded 190 mm. In

the brachycephali the corresponding diameter was in one case as low as 164 mm., and it exceeded in only two cases 180 mm. The stephanic diameter was usually greater than the asterionic, although sometimes the asterionic was wider in the same skull; but the average stephanic was markedly less than in the brachycephali. Below the parietal eminences the skulls were wall-sided. With three exceptions they were phænozygous.

Norma lateralis.—These skulls showed a continuous gentle curve from the glabella to the inion, and had not an abrupt descent from the obelion to the inion which characterised the brachycephalic crania above described. There was no definite sign of flattening from artificial pressure. The glabella and supraciliary ridges were not particularly prominent, even in the male skulls, and the frontal profile receded in them from the glabella. The cerebellar region of the occiput, although not horizontal, yet did not slope so much upwards to the inion as in the brachycephali. Many of the crania when placed on a plane surface rested behind on the conceptacula cerebelli, but some rested on the occipital condyles. The frontal longitudinal arc exceeded in eight specimens the parietal, but in six specimens was below it. The parietal arc was in excess of the occipital in all except three specimens.

The osseous bridge of the nose was concave or concavo-convex, and sometimes so curved that the nostrils would doubtless have been directed downwards and forwards. The nasal bones varied in length from 20 to 25 mm., and in greatest breadth from 5 to 13 mm. The nasal spine of the superior maxillæ was not strongly marked. The sides of the nasal opening were rounded at their junction with the floor of the nose. The interzygomatic and intermalar diameters were greater than either the stephanic or asterionic. The interzygomatic diameter approached more closely the greatest breadth in the parieto-squamous region than in the brachycephali from the same locality, and in three instances somewhat exceeded it. The mean interorbital width was 24 mm.; the maximum 28 mm., the minimum 20 mm. In some of the skulls the teeth had been lost, and some others were much worn, but there was no decay. In several of the crania obliteration of the sutures from age was in progress. In four specimens Wormian bones were in the lambdoidal suture. The os planum of the ethmoid was normal. No skull was metopic, and there was no subdivision of the malar bone. Faint indications were seen on the hard palate of the maxillo-premaxillary suture in two specimens. In one skull a deep-seated exostosis projected from the anterior wall of the external meatus. In B a spheno-pterygoid foramen was present on each side, and in W a projection from the sphenoidal spine approached the external pterygoid plate of the sphenoid. D had a paramastoid process on the left side. In several of these crania a suture extended from the infraorbital foramen into the floor of the orbit and infraorbital canal.

In the lower jaws the sigmoid notches had no great depth; the chin was not massive. The intergonial width was in three cases equal to the gonio-symphysial length, though in two it surpassed and in two was somewhat less than the latter.

In this series of skulls the mean cephalic index for each sex was 73, the minimum both a male and a female 71, and the maximum both males and females 74. They are therefore distinctly dolichocephalic. The mean vertical index was 75, which is considerably below that of both the groups of brachycephali in Tables IX. and X., and exists both in the male and female series. They are therefore metriocephalic. The mean basi-bregmatic height of the seven female skulls was 136 mm.; the maximum height was 140 mm., and the minimum was 132 mm. The mean corresponding height of six male skulls was 143 mm.; the maximum was 150 mm., and the minimum was 138. These measurements are confirmatory of the observations made by Ecker, Cleland, and

Table XI.—Oahu, Sandwich Islands, Chal.

Dolichocephali.

	Collection,	C.	D.	G.	Q.	R.	U.	Y.	Ad.	A.*	B.*	L.*	W.	X.	Ae.	Ag.
	Age,	Aged.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Aged.	Aged.	Ad.
	Sex,	M.	M.	M.	M.?	M.	M.?	M.	M.	F.	F.	F.	F.	F.	F.	F.
	Cubic capacity,	...	1465	1345	...	1332	1488	...	...	1218	1470	1362	1280	1425	1227	1358
	Glabello-occipital length,	188	184	186	184	184	194	192	188	175	193	186	182	186	180	180
	Ophryo-occipital ,,	187	182	180	182	181	192	189	185	175	193	182	180	182	178	179
	Basi-bregmatic height,	150	146	144	...	142	140	...	138	136	138	136	135	140	132	133
	Vertical Index,	*80*	*78*	*77*	...	*77*	*72*	...	*73*	*77*	*71*	*73*	*74*	*74*	*73*	*74*
	Minimum frontal diameter,	100	94	102	87	90	99	99	96	90	98	96	93	95	88	92
	Stephanic, ,, ,,	108	104	110	108	108	114	116	118	102	100	110	112	112	95	110
	Asterionic, ,, ,,	110	104	109	104	108	108	110	100	100	97	106	104	108	108	104
	Greatest breadth,	138*p*	134*p*	138*s*	136*p*	132*s*	138*p*	142*s*	138*s*	128*p*	138*p*	138*s*	136*s*	137*p*	130*p*	134*s*
	Cephalic Index,	*73*	*73*	*74*	*74*	*72*	*71*	*74*	*73*	*73*	*71*	*74*	*74*	*74*	*72*	*74*
	Horizontal circumference,	538	510	515	503	508	541	538	524	485	530	522	511	515	494	508
	Frontal longitudinal arc,	134	123	123	131	135	128	127	130	127	136	124	128	130	120	114
	Parietal, ,, ,,	130	...	123	124	127	127	142	129	132	131	135	127	110	128	120
	Occipital, ,, ,,	116	...	112	118	119	136	...	...	104	118	118	113	133	122	130
	Total ,, ,,	380	375	358	373	381	391	...	...	363	385	377	368	373	370	364
	Vertical transverse arc,	310	314	298	293	307	312	315	311	300	310	302	298	308	295	302
	Length of foramen magnum,	34	36	31	...	35	33	...	...	33	35	34	33	37	30	36
	Basi-nasal length,	118	107	116	...	104	109	...	108	96	108	104	102	108	104	99
	Basi-alveolar length,	110	110	116	...	...	104	...	109	92	108	108	101	97	108	100
	Gnathic Index,	*93*	*103*	*100*	...	...	*95*	...	*101*	*96*	*100*	*104*	*99*	*90*	*104*	*101*
	Interzygomatic breadth,	132	141	142	126	134	137	136	...	118	...	135	132	137	126	..
	Intermalar ,,	116	121	124	112	116	120	124	120	108	115	119	116	116	114	115
	Ophryo-alveolar length,	87	84	85	82	...	84	91	91	78	89	88	83	88	90	87
	Naso-alveolar ,,	65	63	63	61	...	64	66	70	55	63	63	65	65	68	65
	Facial Index,	*66*	*59*	*60*	*63*	...	*61*	*67*	...	*66*	...	*65*	*62*	*64*	*71*	...
	Nasal height,	56	60	53	50	53	48	51	52	41	51	49	51	52	50	51
	Nasal width,	26	27	27	23	...	26	27	24	23	27	27	26	26	24	25
	Nasal Index,	*46*	*45*	*51*	*46*	...	*54*	*53*	*46*	*56*	*53*	*55*	*51*	*50*	*48*	*49*
	Orbital width,	40	40	37	35	36	38	39	39	35	39	38	36	39	37	38
	Orbital height,	36	34	34	31	30	30	35	36	31	34	32	31	34	32	36
	Orbital Index,	*90*	*85*	*92*	*89*	*83*	*79*	*90*	*92*	*89*	*87*	*84*	*86*	*87*	*86*	*95*
	Palato-maxillary length,	54	59	58	54	...	58	56	57	53	56	56	51	48	56	51
	Palato-maxillary breadth,	61	59	63	63	...	65	61	59	53	64	65	58	61	60	62
	Palato-maxillary Index,	*113*	*100*	*109*	*117*	...	*112*	*109*	*103*	*100*	*114*	*116*	*114*	*127*	*107*	*121*
Lower Jaw.	Symphysial height,	24	28	33	...	25	...	...	...	25	31	30	...	...	...	...
	Coronoid ,,	64	65	72	...	62	...	...	...	60	67	67	...	...	...	...
	Condyloid ,,	...	63	68	...	60	...	...	...	55	62	62	...	...	...	...
	Gonio-symphysial length,	84	86	98	...	84	...	...	...	86	92	95	...	...	...	...
	Intergonial width,	88	93	98	...	84	...	...	...	86	88	93	...	...	...	...
	Breadth of ascending ramus,	36	38	43	...	36	...	...	...	36	43	43	...	...	...	...

* With Pelvis.

other craniologists, that the female skull has a less vertical diameter than the male. In the male crania the height and breadth in one skull were equal, in all the others the height of each skull exceeded its breadth by from 2 to 12 mm. In the female crania six were either equal or almost equal in height and breadth, and in only one specimen did the height surpass the breadth by 8 mm. The mean gnathic index was 98·6, *i.e.*, mesognathous; four of the skulls were orthognathous, six mesognathous, and two, both of which were females, decidedly prognathous. The mean nasal index was 50, *i.e.*, mesorhine, but four specimens were leptorhine, and three were platyrhine. The mean orbital index was 87·6, *i.e.*, mesoseme; only two specimens were microseme, whilst five were megaseme. The mean palato-maxillary index was 111, and it is remarkable that in two of the specimens the length and breadth were equal, whilst in a third the breadth exceeded the length by only 2 mm. The mean capacity was 1361 c.c.; that of four males 1407·5 c.c.; that of seven females 1334 c.c. The general average, as well as that of the males, was mesocephalic, the females microcephalic. The average is much below that of the brachycephali measured in Tables IX. and X., which though in part, perhaps, to be accounted for by the smaller proportion of male skulls, is presumably also in part due to racial differences.

This group of Sandwich Islanders was, in its average proportions, dolichocephalic, metriocephalic, as a rule phænozygous, mesognathic, mesorhine, mesoseme, mesuranic, and mesocephalic.

From the great differences in the absolute and relative length and breadth of these dolichocephalic crania as compared with the brachycephalic skulls described on p. 65, as well as from the difference in their vertical index, I can have no doubt that the dolichocephalic skulls belonged to a different race from those that had the brachycephalic form and proportions.

Eleven skulls from Oahu ranged in their cephalic index from 75 to 79 inclusive, and were mesaticephalic, therefore, in their proportions. They were all adults; six were presumably males and five females. Although I have grouped them in a table separate from the purely brachycephalic and dolichocephalic skulls from the same locality, I do not wish it to be supposed that I regard them as belonging to a distinct race. The line, indeed, which separates mesaticephalic skulls, on the one hand from dolichocephali, and on the other from brachycephali, is quite arbitrary, so that crania with mesaticephalic proportions pass almost insensibly either into brachycephalic or dolichocephalic according to their place either at the upper or lower term of the series. Such skulls as E, F, N, and T (Table XII.), had a cephalic index so little above 74·9, which it is customary to assume to be the highest term of the dolichocephalic series, and were so closely allied in shape to the dolichocephalic skulls (Table XI.), that there can, I think, be no doubt they were of the same race. If they had therefore been included with them in Table XI., they would have slightly raised the cephalic index of the dolichocephalic series.

On the other hand, O, P, and M, with a cephalic index of either 78 or 79, not only approached in dimensions the lowest term of the brachycephalic series, but corresponded with those skulls in the form of the parieto-occipital region, and ought perhaps to have been associated with that series (Table X.) The four skulls which have a cephalic index

TABLE XII.—OAHU, SANDWICH ISLANDS.

Mesaticephali.

		E.	H.	N.	O.	P.	T.	F.	M.	Z.	Ab.	Af.
	Collection,	E.	H.	N.	O.	P.	T.	F.	M.	Z.	Ab.	Af.
	Age,	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Aged.	Ad.	Ad.	Ad.	Ad.
	Sex,	M.	M.	M.	M.	M.	M.?	F.	F.	F.	F.	F.
	Cubic capacity,	1418	1478	1364	1330	1476	1495	1412	1226	...	...	1450
	Glabello-occipital length,	181	179	188	180	182	189	182	172	182	183	186
	Ophryo-occipital ,,	179	175	184	176	179	186	181	172	182	181	185
	Basi-bregmatic height,	142	138	134	140	135	139	137	132	128	...	130
	Vertical Index,	*78*	*77*	*71*	*78*	*74*	*73*	*75*	*77*	*70*	...	*70*
	Minimum frontal diameter,	98	90	94	90	95	92	96	91	95	93	87
	Stephanic, ,, ,,	114	106	108	109	116	114	109	107	112	116	106
	Asterionic, ,, ,,	104	104	109	107	115	108	108	102	109	108	107
	Greatest breadth,	138*p*	138*s*	142*p*	142*s*	144*s*	142*p*	137*s*	134*p*	141*s*	141*p*	143*p*
	Cephalic Index,	*76*	*77*	*75*	*79*	*79*	*75*	*75*	*78*	*77*	*77*	*77*
	Horizontal circumference,	507	509	522	512	528	530	521	490	520	514	520
	Frontal longitudinal arc,	130	133	123	127	130	130	130	126	130	130	126
	Parietal ,, ,,	120	139	131	126	122	129	127	124	144	125	132
	Occipital ,, ,,	120	101	120	115	121	119	111	110	104	115	122
	Total ,, ,,	370	373	374	368	373	378	368	360	378	370	380
	Vertical transverse arc,	310	312	304	304	308	307	313	296	317	303	312
	Length of foramen magnum,	34	31	34	30	35	35	35	33	30	...	32
	Basi-nasal length,	106	106	107	108	102	106	108	98	105	...	104
	Basi-alveolar length,	102	108	111	100	...	100	...	96	107	...	...
	Gnathic Index,	*96*	*102*	*104*	*93*	...	*94*	...	*98*	*102*	...	...
	Interzygomatic breadth,	133	128	...	131	134	130	134	124	...	132	123
	Intermalar ,,	122	112	118	119	119	114	114	106	108	116	110
	Ophryo-alveolar length,	94	84	86	...	84	90	...	83	85	86	...
	Naso-alveolar ,,	70	61	65	...	61	69	...	62	65	65	...
	Facial Index,	*71*	*66*	...	...	*63*	*69*	...	*67*	...	*65*	...
	Nasal height,	52	47	50	55	47	52	55	47	50	48	47
	Nasal width,	24	25	24	27	25	26	26	23	25	27	25
	Nasal Index,	*46*	*53*	*48*	*49*	*53*	*50*	*47*	*49*	*50*	*56*	*53*
	Orbital width,	39	36	39	38	37	37	40	34	38	37	35
	Orbital height,	34	34	36	36	33	32	37	32	34	33	33
	Orbital Index,	*87*	*94*	*92*	*95*	*89*	*86*	*92*	*94*	*89*	*89*	*94*
	Palato-maxillary length,	58	56	58	...	54	56	...	53	57	54	...
	Palato-maxillary breadth,	64	...	63	...	64	64	...	55	59	63	...
	Palato-maxillary Index,	*110*	...	*109*	...	*118*	*114*	...	*104*	*103*	*117*	...
Lower Jaw.	Symphysial height,	29	...	...	...	...	...	...	29	...	...	...
	Coronoid ,,	75	...	...	...	...	...	...	57	...	...	...
	Condyloid ,,	73	...	...	...	..	...	62	56	...	...	...
	Gonio-symphysial length,	89	...	...	...	...	...	88	83	...	...	...
	Intergonial width,	96	...	...	...	...	...	94	80	...	...	...
	Breadth of ascending ramus,	37	..	...	...	...	...	41	32	...	...	...

of 77 are more difficult to arrange, but on the whole I am inclined to think that they approach more closely in shape to the dolichocephali than to the brachycephali.

For the most part these skulls rested either on the mastoids or occipital condyles, but four touched the table behind with the lower part of the cerebellar fossæ. In each specimen the frontal arc was longer than the occipital. In one the parietal and occipital arcs were equal, in the others the parietal exceeded the occipital. In four skulls the parietal exceeded the frontal. The stephanic diameter exceeded the asterionic except in two specimens, in each of which the asterionic was 1 mm. the greater. In all, the interzygomatic diameter was less than the greatest breadth in the parieto-squamous region. The basi-nasal length was in three cases less than the basi-alveolar. No skull was metopic.

As regards variations in individual skulls, Af. has an epipteric bone in the left pterion, and in the right pterion the squamous temporal articulated directly with the frontal. In three specimens one or at most two small Wormian bones were in the lambdoidal suture. H showed some want of symmetry in the occipito-parietal region, the left half of the occiput projecting behind the right; the cranial sutures were unossified, except the lower third of the left coronal, which was obliterated. In several of the skulls a suture extended from the infraorbital foramen into the floor of the orbit and infraorbital canal.

The vertical index of these mesaticephalic crania was 74 c.c.; in two specimens this index was equal to the cephalic, and in one slightly above it, but in all the other skulls the cephalic index exceeded the vertical. The lowest basi-bregmatic diameter in the female series was 128 mm., the highest 137 mm.; whilst in the male series the lowest corresponding diameter was 134 mm., and the highest 142 mm. The mean height of the female skulls was 132 mm., that of the males 138 mm. One of the skulls was prognathous, three orthognathous, three mesognathous, but the differences in the gnathic index did not correspond in any definite way with differences in the cephalic index, for the prognathous skull N, with a cephalic index 75, had a gnathic index 104, whilst the orthognathous skull T, with the same cephalic index, had a gnathic index of only 94. The nasal and orbital indices also showed a great range of variation, but there was no definite relation between these variations and that of the cephalic index. The mean internal capacity of the nine crania which it was possible to measure was 1405 c.c., *i.e.*, mesocephalic; the mean of six males was 1427 c.c., that of three females 1363 c.c. The mean of each sex was also mesocephalic.

CHATHAM ISLANDERS (MORIORI).

Plate VII. Tables XIII., XVIII., XIX.

Four crania, viz.: three adults and one child were collected. They were presented by the Colonial Museum of New Zealand, and formed a part of the large collection of crania from these islands obtained in 1872 by Mr. Travers. I have examined, along with these crania, three other specimens, also collected by Mr. Travers, which were presented some years ago to the Anatomical Museum of the University of Edinburgh, by Dr. Hector, a skull recently presented by Mr. A. H. Williams, and one from Au nui (great cloud), Wharekauri, on the north side of Chatham Island, formerly belonging to Dr. Handyside, and now in the University Museum. The crania were probably those of six men, two women, and a child, aged about six years.

Norma verticalis.—Most of the skulls had no marked antero-posterior elongation. The parietal tubera were prominent, and gave the appearance of breadth in the parietal region. There was a tendency in some of the skulls to a ridge-like elevation in the sagittal line. The cranial vault was flattened from that line outwards to the tubera, but with not much slope. The sides of the skull were almost vertical below the tubera. All the crania were phænozygous, except that of the child. As a rule the greatest width of the skull was at or near the parietal eminences. In four specimens the stephanic diameter exceeded slightly the asterionic; in four the asterionic was somewhat greater than the stephanic; in one they were equal.

Norma lateralis.—The adults all rested behind on the tips of the mastoid processes, except one, which rested on the occipital crest; but the child's skull touched the cerebellar occipital fossæ. The male crania were massive and heavy, with strong temporal ridges, and marked duplicity of these ridges was observed in the skulls. Owing to the especial prominence of the temporal ridges in the male skulls, these crania had a definite line of demarcation between the upper and lower halves of the parietal bone, so that in the norma occipitalis the skulls had the pentagonal form so well represented by Hyrtl in a Chatham Island skull.[1] One of the male skulls weighed with the lower jaw, 2 lbs. 7 oz. avoir., another 2 lbs. $6\frac{1}{4}$ oz. The glabella and supraciliary ridges, more especially in one specimen, were projecting, and the frontal bone sloped from them upwards and backwards; the backward slope of the forehead was very marked in several of the males. In two specimens the ophryo-occipital length was 5 mm. less than the glabello-occipital. From a little in front of the obelion the vault sloped downwards and backwards to the occipital point, but there was no evidence of artificial flattening. The occipital squama projected beyond the protuberance, but only very slightly in three specimens. The

[1] Die doppelten Schläfelinien, &c., *Denkschr. d. k. Akad. d. Wiss. Wien*, 1871.

frontal longitudinal arc in each adult male and in one female was greater than either the parietal or occipital; the parietal exceeded the occipital and the occipital the parietal in an almost equal number of crania. In the child the occipital arc was greater than the parietal, and the parietal than the frontal.

The bridge of the nose was fairly well defined and concave upwards and forwards, though in some it was slightly convex at the tip. The nasal bones ranged in length from 21 to 31 mm. and in greatest width from 6 to 15 mm. The nasal spine of the superior maxillæ was distinct, as a rule not very prominent, but in one specimen of considerable size. The junction of the side wall with the floor of the anterior nares was slightly rounded. Three of the crania had the external orbital process prominent, with flattening of the frontal immediately above the process.

In all the adults both the interzygomatic and intermalar diameters exceeded the stephanic and asterionic, and except in one case, where they were equal, the interzygomatic diameter was less than the greatest breadth in the parieto-squamous region. The mean interorbital diameter was 23 mm.; the maximum 26 mm., the minimum 19 mm.

The teeth in all the adults were fully erupted, though many of the sockets were empty. In the aged skulls the teeth were much worn down, but there was no decay. The dentition of the child was that of about six years.

In five specimens the sutures were in course of senile obliteration. When visible they showed no special simplicity in their denticulation. The child's skull had Wormian bones in the pterion on each side, and also in the lambdoidal suture. One adult had one in the right pterion; another one in the left pterion. A male had a large interparietal bone, and in the suture between it and the left parietal were three small Wormian bones. In none did the temporal articulate with the frontal, although the intervening alisphenoid was sometimes very narrow. No cranium was metopic. The os planum was broken in several crania, but had evidently been relatively small, though it retained its quadrilateral form. In the child and in two adults remains of the maxillo-premaxillary suture were seen on the hard palate. There was no subdivision of the malar. In one the left meatus auditorius was almost obliterated in its deep part by an exostosis, but the right was normal. In another a small exostosis projected from the roof of the deep part of the left meatus, but the right was normal. In two males the palate had a depth of 1·7 inch opposite the 2nd molar; in the others its depth was not so great. In one female there was an almost complete pterygo-sphenoid foramen; in a male a well-marked third condyle was on the basion, and in the child a right paramastoid process was present. In three of the crania a distinct suture extended from the infraorbital foramen into the floor of the orbit and infraorbital canal. In one adult male there was a pair of rudimentary paramastoid processes.

Four of the adults had the lower jaw, and in each specimen the sigmoid notch was shallow. In three males the jaw was massive with a strong chin, and in two of these

the ascending ramus was high. In the other, a female, the bone was not so strong, and the ascending ramus was much shorter.

The mean cephalic index of the eight adults was 75·2; the range of variation from the maximum 80 (male), to the minimum 72 (male), was 8. The crania were therefore, on the average, just within the mesaticephalic group, although three of the skulls were below 75. The mean vertical index was 73, and the range of variation from the minimum 70 (male)

TABLE XIII.—CHATHAM ISLANDERS (MORIORI).

	Collection,	Chal. A.	Chal. B.	E.U.A.M. A.	E.U.A.M. B.	Whare-kauri.	E.U.A.M. D.	Chal. C.	E.U.A.M. C.	Chal. D.
	Age,	Ad.	Aged.	Ad.	Aged.	Ad.	Ad.	Ad.	Ad.	6th
	Sex,	M.	M.	M.	M.	M.	M.	F.	F.	Year.
	Cubic capacity,	1458	1444	1380	1306	1488	1492	1185	1342	1492
	Glabello-occipital length,	192	190	191	190	191	185	177	184	183
	Ophryo-occipital „	190	188	188	185	186	180	177	182	184
	Basi-bregmatic height,	144	135	134	133	142	142	129	134	123
	Vertical Index,	*75*	*71*	*70*	*70*	*76*	*77*	*73*	*73*	*67*
	Minimum frontal diameter,	104	104	95	92	102	96	92	88	88
	Stephanic, „	116	110	102	107	114	116	101	102	107
	Asterionic, „	114*p*	111*p*	110*s*	110	110	108	101	108	104
	Greatest breadth,	146	138	144	136*p*	146*s*	148*p*	132*p*	137*p*	139*p*
	Cephalic Index,	*76*	*73*	*75*	*72*	*77*	*80*	*75*	*74*	*76*
	Horizontal circumference,	548	532	538	520	542	525	495	508	508
	Frontal longitudinal arc,	140	131	133	130	132	135	117	129	118
	Parietal „ „	119	124	123	124	122	253	129	122	120
	Occipital „ „	123	113	132	124	126		106	116	137
	Total „ „	382	368	388	378	380	388	352	367	375
	Vertical transverse arc,	320	301	310	286	315	316	281	290	38
	Length of foramen magnum	34	34	28	32	34	32	30	34	...
	Basi-nasal length,	113	108	103	110	111	104	100	101	89
	Basi-alveolar length,	106	100	103	104	104	102	100	98	80
	Gnathic Index,	*94*	*92*	*100*	*94·5*	*94*	*98*	*100*	*99*	*90*
	Interzygomatic breadth,	144	138	139	130	144	138	132	126	106
	Intermalar „	128	126	120	119	122	130	116	116	94
	Ophryo-alveolar length,	95	94	91	84	102	95	81	86	81
	Naso-alveolar „	76	71	71	63	77	67	61	67	60
	Facial Index,	*66*	*68*	*65*	*65*	*71*	...	*61*	*68*	*76*
	Nasal height,	58	56	60	51	57	51	46	53	44
	Nasal width,	28	25	25	25	26	25	25	25	20
	Nasal Index,	*48*	*44*	*42*	*49*	*46*	*49*	*54*	*47*	*45*
	Orbital width,	40	38	39	40	38	40	38	38	31
	Orbital height,	35	36	37	33	35	32	31	33	33
	Orbital Index,	*87·5*	*95*	*95*	*82·5*	*92*	*80*	*82*	*87*	*106*
	Palato-maxillary length,	58	56	54	54	58	55	53	56	42
	Palato-maxillary breadth,	66	64	65	61	65	64	59	60	57
	Palato-maxillary Index,	*114*	*114*	*120*	*113*	*112*	*116*	*111*	*107*	*136*
Lower Jaw.	Symphysial height,	32	...	...	...	36	30	29	...	23
	Coronoid „	80	...	...	...	84	66	61	...	50
	Condyloid „	69	...	...	...	73	58	61	...	45
	Gonio-symphysial length,	107	...	...	...	102	99	94	...	77
	Intergonial width,	103	...	...	...	100	...	90	...	74
	Breadth of ascending ramus,	41	...	...	...	40	41	43	..	32

to the maximum 77 (male) was 7. In each skull the height was less than the greatest breadth, and the altitudinal index was less than the cephalic index. The crania were metriocephalic.

The mean gnathic index was 96, and the range of variation from the minimum 92 (male) to the maximum 100 (male and female) was 8. The crania on the average were orthognathic, though three specimens were mesognathic. The mean facial index was 66, and the range of variation from 61, the lowest (a female), to 70·8 the highest (a male), was 10. The mean nasal index was 47, and the range of variation from 42 (male), the minimum, to 54, the maximum (female), was 12. On the average they were leptorhine, only two specimens exceeding the highest term of that series. The mean orbital index was 88, and the range from the lowest, 80 (male), to the highest, 95 (male), was as much as 15. The average was mesoseme, but individuals were either micro-, meso-, or megaseme. The mean palato-maxillary index was 113, and the range from 107, the minimum, to 120, the maximum, was as much as 13; the average was mesuranic. The great width of the palato-alveolar region of the child, as compared with the length, was due to the imperfect molar dentition, as only the first pair of true molars were in place.

The mean internal capacity of the adults was 1387 c.c., the mean of six males was 1428 c.c., of two females 1263·5 c.c., both the females were microcephalic. The general of the two sexes, and of the males was mesocephalic; three males were megacephalic and one microcephalic. It is remarkable that the child, of probably the sixth year, should have had a capacity of 1492 c.c.

The Chatham Island skulls were, therefore, on the mean mesaticephalic, metriocephalic, orthognathic, phænozygous, leptorhine, mesoseme, mesuranic and mesocephalic.

NEW ZEALANDERS (MAORI).

Plate VII. Tables XIV., XV., XVIII., XIX.

Three of the Maori skulls collected by the Challenger were presented by the Colonial Museum, Wellington. One of these was marked Waikato tribe, "the modern Maori," North Island; another was labelled East Cape tribe, North Island (Keu, or red haired); the third was labelled Hawea tribe, or Moa Hunter, West Coast, Jackson Bay, South Island. A fourth specimen was presented by Mr. Travers, of Wellington, but the tribal name was not given. Along with the above I have examined a series of seventeen skulls in the Anatomical Museum of the University of Edinburgh. Seven of these specimens were presented by Dr. J. Batty Tuke, who collected them in 1861, in the district of Cook's Straits; six of these crania were obtained on Kapiti, or Entrance Island, which lies on the north side of the western approach to Cook's Strait;[1] one was taken from an old Maori

[1] As the skulls from Kapiti Island are a very interesting series I transcribe from the Museum Catalogue the following notes by their donor, Dr. J. Batty Tuke, who procured them "whilst on a coasting voyage in the schooner

cooking place, the site of a fight which occurred about 30 years ago near Wanganui, north of Cook's Straits. Three specimens were from Otago; two, presented by Mr. W. Riddell, being from Chastlands Mistake, and one found in an oven at Oipopo. One was found in the Marlborough district of the Middle Island, and was presented by Dr. Philip. One presented by Mr. Lambert, was from Whangarii, to the north of Auckland. Three were from the neighbourhood of Auckland, whilst the localities of the remaining two were not known.

Nine of the twenty-one crania were adults and presumably males, nine were adults and presumably females, two were children about 8 and 10, and one was apparently a girl about 16.

Norma verticalis.—In both the males and females the crania were not uniform in appearance in each sex, for some were obviously longer and narrower than others, and did not dip so abruptly in the parieto-occipital region, so that their proportions were dolichocephalic, others were wider in the parietal region and mesaticephalic. In the males the sagittal line was slightly ridged, the parietal eminences as a rule were prominent, and the cranial vault sloped, and was flattened from the ridge to the eminences. The sides of the skull were almost vertical below the parietal tubera. All the skulls, with one exception, were phænozygous. The stephanic and asterionic diameters were equal in one specimen; in four the stephanic exceeded the asterionic; in four the asterionic exceeded the stephanic. In the females the sagittal line, except in three specimens, was not so ridge-like as in the males, and the slope from that line outwards to the tubera was less. All the skulls were phænozygous. The stephanic and asterionic diameters were equal in one specimen; in three the stephanic exceeded the asterionic; in five the asterionic was greater than the stephanic.

Norma lateralis.—Of the male skulls four rested behind on the mastoids; two on the occipital condyles; three on the conceptacula cerebelli. Of the females, three rested on the mastoids; three on the condyles; one on the conceptacula. The male crania were not so massive as those of the Moriori, for the heaviest male skull did not exceed 1 lb. 15 oz. avoir., and the next in weight was 1 lb. $12\frac{3}{4}$ oz. The inion, glabella, and supraciliary ridges were prominent. The forehead was more retreating in the males than in the females, and in the skulls with a relatively high cephalic index the descent from

"Tyne" during October 1861. We were driven by stress of weather under the lee of this island, which was at that time uninhabited except by two white men in charge of a small cattle Station. Two of the skulls (the females?) were found with their skeletons buried under ledges of rock; the others in a cave the descent to which was by a narrow shaft, and which was filled with human bones the amount of which it was quite impossible to compute. I sunk to my waist in them, and should have gone further if not supported, the lower strata being quite disorganised. This cave was the burying place of a hapu or family of the Ngatirankawa Tribe, living at Waikanai and Otaki on the mainland about eight miles distant. All such burying places are strictly held "tapu," or sacred, so that it is beyond suspicion that any of these could possibly be European skulls. Had there been natives on the island it would have been impossible to have secured these specimens. As it was, great difficulty was experienced from the superstition of the English sailors of the schooner. I have been given to understand by competent authorities that no white man had ever been in that cave before."

the obelion into the occipital region was steeper than in the more elongated crania. The occipital squama projected behind the inion, but in some specimens the projection was very slight. In the males the frontal longitudinal arc was in one case equal to the occipital, but in all the other specimens exceeded it. In six cases the frontal exceeded the parietal, in three the parietal arc was the longer. In five the parietal was greater than the occipital. In the females the frontal longitudinal arc was greater than the occipital in all the specimens except one; in two cases the frontal equalled, in four exceeded, and in one was less than the parietal. The parietal arc exceeded the occipital in four specimens, and in two was less than it.

The bridge of the nose was concave upwards and forwards, sometimes with a deep curve, in others slightly convex, near the tip. The nasal bones ranged in length from 20 to 34 mm., and in greatest width from 6 to 11 mm. The skull (Kapiti C) in which the nasal was 34 mm. by 11 mm., was that in which the interorbital diameter was 29 mm. The nasal spine of the superior maxillæ was distinct, though not as a rule very prominent. The anterior nares in some skulls were markedly wider than in others. Many of the crania were flattened in the frontal region immediately above the external orbital process, and this process was therefore prominent. In both males and females the interzygomatic and intermalar diameters exceeded the stephanic and asterionic in the same skull. The relations of the interzygomatic and greatest diameter in the parieto-squamous region were variable; in four cases the interzygomatic exceeded the inter-parietal, in six it was less, and in one it was equal. The interorbital diameter ranged from 21 to 29 mm.

In five skulls the upper wisdom teeth were either not erupted, or were shed, and the alveoli absorbed. The teeth in the aged skulls were much worn, and the crowns flattened but not decayed. From the dentition of the young skulls, they were children apparently of 8, 10, and 16 years.

In six specimens the sutures of the cranial vault had almost disappeared from senile obliteration, and in another they were partially synostosed. In many of the crania the sutures at and near the bregma were very simple in their denticulation. No skull was metopic. Wormian bones were present in several specimens in the lambdoidal suture, and in two crania a pair of large triquetrals occupied the lambda. In one a considerable epipteric bone was in each pterion, and in the child of 8 the left squamous temporal articulated directly with the frontal, but the right did not. The os planum of the ethmoid, though relatively small, was normal in shape. The maxillo-premaxillary suture was faintly seen in several adults, and more distinctly in the children on the anterior part of the hard palate. The malar bone was not divided. In many of the crania, both adults and two of the children, a denticulated suture passed through the inferior border of the orbit from the infraorbital foramen to the roof of the infraorbital canal, immediately internal to the malo-maxillary suture. In one adult the left auditory meatus

was greatly narrowed by a broad based exostosis projecting both from the anterior and posterior walls, whilst in the right meatus a smaller projected from the posterior wall only. Another skull had a similar exostosis from the posterior wall of the right meatus. A female skull had a third condyle at the basion. The dimensions of the lower jaw are given in the table; in no instance was it particularly massive. The intergonial and intersymphysial diameters closely approximated to each other.

The mean cephalic index of the eighteen adult skulls was 74: that of the nine males 74·4; that of nine females 73. The average was therefore in the upper term of the dolichocephalic series. The range in the males was from 70 to 78; in the females from 67 to 78. As the index of nine was 75 and upwards, these were all mesaticephalic. A child of 8 with a cephalic index of 82 was brachycephalic. The mean vertical index of sixteen adults was 73·5, that of seven males 74·1, that of eight females 72·87. The

TABLE XIV.—NEW ZEALANDERS (MAORI)—MALES.

	Collection,	Chal. Waikato.	Kapiti Island, E.U.A.M. A.	Kapiti Island, E.U.A.M. B.	Kapiti Island, E.U.A.M. C.	63c.	5.	Chastlands.	Aucklland.	Marlborough.
	Age,	Ad.	Ad.	Ad.	Ad.	Ad.	Ad.	Aged.	Aged.	Ad.
	Sex,	M.	M.	M.	M.	M.	M.	M.	M.	M.
	Cubic capacity,	1350	1318	1336	1520	...	1526	1356	1494	1586
	Glabello-occipital length,	178	179	180	196	195	192	182	194	199
	Ophryo-occipital ,,	177	177	174	193	194	189	178	188	196
	Basi-bregmatic height,	134	135	136	135	...	150	140	138	144
	Vertical Index,	*75*	*75*	*76*	*69*	...	*78*	*77*	*71*	*72*
	Minimum frontal diameter,	92	98	92	103	102	100	93	90	99
	Stephanic,	112	110	105	110	116	112	110	108	110
	Asterionic,	112	100	107	114	113	118	108	116	106
	Greatest breadth,	136	140*p*	136*s*	138*s*	142	143	138*s*	146*s*	144*p*
	Cephalic Index,	*76*	*78*	*76*	*70*	*73*	*74*	*76*	*75*	*72*
	Horizontal circumference,	501	516	504	550	547	532	514	540	542
	Frontal longitudinal arc,	126	120	127	130	140	132	133	144	133
	Parietal ,, ,,	123	134	110	136	125	139	112	126	130
	Occipital ,, ,,	115	110	120	115	...	114	133	118	131
	Total ,, ,,	364	364	357	381	...	385	378	388	394
	Vertical transverse arc,	304	298	298	310	310	324	308	304	306
	Length of foramen magnum,	35	31	32	37	...	35	31	36	40
	Basi-nasal length,	104	101	106	109	...	114	104	107	106
	Basi-alveolar length,	101	95	103	106	...	110	99	103	97
	Gnathic Index,	*97*	*94*	*97*	*97*	...	*96*	*95*	*96*	*91·5*
	Interzygomatic breadth,	132	134	137	144	...	146	138	144	...
	Intermalar ,,	116	120	124	132	125	128	121	124	129
	Ophryo-alveolar length,	94	82	91	98	86	87	88	91	93
	Naso-alveolar ,,	67	59	65	75	67	66	65	69	68
	Facial Index,	*71*	*60*	*66*	*68*	...	*59*	*64*	*63*	...
	Nasal height,	52	50	54	56	55	49	54	54	55
	Nasal width,	27	21	28	26	24	28	24	24	26
	Nasal Index,	*52*	*42*	*52*	*46*	*44*	*57*	*44*	*44*	*47*
	Orbital width,	37	41	37	48	40	39	40	40	40
	Orbital height,	35	32	32	36	34	34	36	34	37
	Orbital Index,	*95*	*78*	*86*	*75*	*85*	*87*	*90*	*85*	*92·5*
	Palato-maxillary length,	55	56	56	58	...	62	56	...	51
	Palato-maxillary breadth,	65	57	63	65	...	69	...	67	66
	Palato-maxillary Index,	*118*	*102*	*112*	*112*	...	*111*	...	...	*129*
Lower Jaw.	Symphysial height,	29	...	...	31	...	35	33	...	...
Lower Jaw.	Coronoid ,,	64	...	...	62	...	76	68	...	...
Lower Jaw.	Condyloid ,,	63	...	...	61	...	60	60	...	...
Lower Jaw.	Gonio-symphysial length,	89	...	...	95	...	88	96	...	...
Lower Jaw.	Intergonial width,	84	...	...	96	...	94	96	...	...
Lower Jaw.	Breadth of ascending ramus,	36	...	...	38	...	34	43	...	...

general mean as well as that of each sex was metriocephalic. The mean basi-bregmatic height of eight females was 134 mm., the maximum being 140 mm., and the minimum 125 mm. The mean corresponding height of eight males was 139, the maximum being 150 mm., the minimum 134 mm. In the males the height and breadth in two skulls were equal; in four the breadth exceeded the height, in two the height exceeded the breadth. In the females the breadth exceeded the height in four specimens, whilst in the other four the height was greater than the breadth.

The mean gnathic index in the males was 95·4, in the females 97; so that the average in both was orthognathous. None of the males exceeded 97, but one female reached 100 and another 103; both of these, therefore, were mesognathous. The mean nasal index was 47·5 in the males, and 51 in the females; the average in both was

TABLE XV.—NEW ZEALANDER'S (MAORI)—FEMALES.

	Collection,	Chal. East Cape.	Chal. Hawea.	Chal. Wellington.	Kapiti D.	Wanganui. 63a.	Whangarii.	Chastlands.	Aucklland.	Otipopo.	Kapiti E.	Kapiti. F.	Aucklland.
	Age,	Adult.	Ad.	Ad.	Aged.	Ad.	Aged.	Aged.	Aged.	Ad.	Aet. 8.	Youth, Aet. 16.	Aet. 10.
	Sex,	F.?	F.	F.?	F.	F.	F.	F.	F.	F.	...	...	...
	Cubic capacity,	1250	1216	1378	1326	...	1240	1364	1540	...	1472	1308	1405
	Glabello-occipital length,	182	180	182	195	188	180	182	193	180	178	177	177
	Ophryo-occipital ,,	181	178	180	194	188	179	180	189	180	178	179	178
	Basi-bregmatic height,	134	133	136	138	...	125	138	140	130	126	124	134
	Vertical Index,	*74*	*74*	*75*	*71*	...	*69*	*76*	*72*	*72*	*71*	*70*	*76*
	Minimum frontal diameter,	90	90	100	90	94	93	98	93	94	94	90	86
	Stephanic, ,,	98	102	108	103	110	108	114	110	103	111	109	103
	Asterionic, ,,	100	107	112	115	108	108	108	108	106	108	100	106
	Greatest breadth,	130*p*	128*s*	139*s*	130*s*	142	129	141*p*	138*p*	140	146*p*	128	137*p*
	Cephalic Index,	*71*	*71*	*76*	*67*	*75*	*72*	*77*	*71*	*78*	*82*	*72*	*77*
	Horizontal circumference,	502	495	515	534	525	502	512	530	510	507	493	494
	Frontal longitudinal arc,	132	114	127	131	140	...	135	130	124	132	123	130
	Parietal ,, ,,	127	...	127	113	140	...	127	135	110	117	127	125
	Occipital ,, ,,	113	...	126	139	...	...	113	125	122	121	113	116
	Total ,, ,,	372	360	380	383	...	352	375	390	356	370	363	371
	Vertical transverse arc,	298	284	303	300	315	...	310	304	293	304	288	295
	Length of foramen magnum,	31	34	29	36	...	37	33	33	32	36	35	34
	Basi-nasal length,	102	100	100	107	...	99	100	106	104	92	93	92
	Basi-alveolar length,	100	95	95	100	...	102	94	106	...	90	91	85
	Gnathic Index,	*98*	*95*	*95*	*93*	...	*103*	*94*	*100*	...	*98*	*98*	*92*
	Interzygomatic breadth,	120	...	134	...	...	131	134	...	...	120	113	110
	Intermalar ,,	110	114	122	...	114	109	120	116	...	105	103	98
	Ophryo-alveolar length,	98	85	82	92	90	83	83	90	...	80	70	71
	Naso-alveolar ,,	68	63	60	70	66	59	62	69	...	60	52	53
	Facial Index,	*82*	...	*61*	...	...	*63*	*62*	...	...	*67*	*62*	*64*
	Nasal height,	48	44	45	54	55	42	51	51	...	45	41	42
	Nasal width,	23	25	27	24	24	26	26	23	...	20	22	21
	Nasal Index,	*48*	*57*	*60*	*44*	*44*	*62*	*51*	*45*	...	*44*	*54*	*50*
	Orbital width,	35	37	38	40	36	41	40	40	38	35	33	31
	Orbital height,	33	33	33	37	35	34	33	33	36	33	30	31
	Orbital Index,	*94*	*89*	*87*	*92*	...	*83*	*82*	*82*	*95*	*94*	*91*	*100*
	Palato-maxillary length,	55	...	54	54	...	54	49	57	...	52	47	43
	Palato-maxillary breadth,	60	62	61	63	...	59	61	63	...	59	58	60
	Palato-maxillary Index,	*109*	...	*113*	*117*	...	*109*	*124*	*110*	...	*113*	*123*	*139*
Lower Jaw.	Symphysial height,	31	...	29	...	...	30	29	...	...	25	...	...
	Coronoid ,,	65	...	69	...	...	61	67	...	...	53	...	...
	Condyloid ,,	53	...	67	...	...	56	63	...	...	49	...	...
	Gonio-symphysial length,	87	...	91	...	...	80	84	...	...	77	...	...
	Intergonial width,	83	...	89	...	...	83	...	...	...	79	...	...
	Breadth of ascending ramus,	38	...	32	...	...	33	33	...	...	33	...	...

mesorhine ; but of the males six were leptorhine and one platyrhine, whilst of the females three were platyrhine and three leptorhine. The mean orbital index in the males was 86, in the females 88 ; the average in both was mesoseme, but of the males three were megaseme and two microseme ; and of the females three were megaseme and three microseme. In the three children the index in each case was megaseme. The mean palato-maxillary index was 114 in the adult males, and 113·6 in the females ; in one male the breadth exceeded the length by only 1 mm.; the palato-alveolar region was mesuranic.

The mean internal capacity of fifteen adult crania was 1387 c.c.; eight probable males had a mean capacity of 1436 c.c.; seven probable females of 1330·5. The general mean of the whole series and of the males was mesocephalic ; that of the females was microcephalic. Four males were megacephalic, two were microcephalic. Four females were microcephalic and only one megacephalic. Of the young crania, one, aged about eight, was megacephalic.

The characters of these New Zealand skulls may be summarised as follows :—dolichocephalic, but on the verge of mesaticephalic, metriocephalic, phænozygous, orthognathic, mesorhine, mesoseme, mesuranic, and mesocephalic.

COMPARISON OF THE CRANIA OF THE PACIFIC ISLANDERS.

As the collection of human bones formed by H.M.S. Challenger included crania from several of the smaller islands in the Pacific Ocean, I may take this opportunity both of comparing these skulls with each other, and of making a general survey of the cranial characters of the people of the South Sea Islands. Our knowledge of these islanders has been greatly extended of late years by the labours of missionaries, by commercial enterprise, and by the visits of ships-of-war of various nationalities. Numerous descriptions of the people, their physical characteristics, customs, implements, weapons, and language have been written, and crania have been collected and deposited in many European museums. In making this comparison, I shall avail myself both of the crania that I have personally examined and of the published descriptions of skulls so far as I have been able to obtain access to the literature of this subject.

From the descriptions which have been given of the aborigines of the South Sea Islands by numerous travellers, it is now generally admitted that two well-defined races can be recognised. The one, named Papuan or Melanesian, which occupies New Guinea and the smaller islands to the east, south, north, and west. This race is distinguished by its sooty-brown or black skin, black frizzly hair, and well-developed beard. The second, named brown Polynesian or Mahori,[1] which inhabits, as was recognised by Captain Cook, the islands in the more eastern part of the Pacific, from the Sandwich Islands in

[1] This term Mahori is suggested in the article South Sea Islanders, by W. L. Ranken, in *Journ. of Anth. Inst.*, vi. p. 223, 1877 ; also in Australasia, by A. R. Wallace, London, 1880, p. 261.

the north to New Zealand in the south. This race is distinguished by its light brown or somewhat yellow skin, straight black hair, and scanty beard. To these a third race has been added by the name of Mikronesians, which occupies the Pelew, Caroline, Marshall, and Gilbert Islands, scattered in the north-western parts of the Pacific. By many ethnologists these people are not regarded as a distinct type or race, but as a mixture of the Mahori with the Malay, and in a less degree of Papuan, Negrito, Chinese, and Japanese elements.[1] The Challenger collection included crania both of the Papuan and brown Polynesian races, but none from the islands of the Mikronesian group.

The description by Prof. Moseley of the Admiralty Islanders (p. 52) makes it quite clear that in the black-brown colour of the skin of the adults, and in the frizzled hair, which formed a dense mop, these people presented Papuan characters; though, as regards the hair on the face, bushy whiskers and beard seemed to be the exception.

If their crania be compared with those of the Australians they will be found to differ both in general appearance and in many characters which can only be arrived at by the use of cranio-metrical methods. Thus the Australian skulls were heavier, with thicker walls, stronger ridges and processes for muscular attachment, much more projecting glabella and supraciliary ridges, with consequently a much deeper depression at the fronto-nasal suture, and the appearance of a more receding forehead. Further, the summit of the cranium in the Australians was roof-shaped, and exhibited more distinctly an ill-filled character. Both races were dolichocephalic. When the corresponding measures of the skulls of the Admiralty Islanders and of the Australians measured by myself are compared, it will be seen that the mean length-breadth index was equal in the two peoples, but whilst the males were somewhat higher than the females in the Admiralty Islanders, they were below them in the Australians. The vertical index was higher (72) in the Admiralty Islanders than in the Australians (70); but whilst the difference in the two sexes was very slight in the Australians, it was marked in the Admiralty Islanders, the males being 73, the females 70. Both races were microcephalic as regards their cranial capacity, but whilst the Australians, both male and female, were on the average microcephalic, the mean of the male Admiralty Islanders was mesocephalic. The Australian crania were distinctly phænozygous, the Admiralty islanders as a rule were cryptozygous. The Australians were less prognathous than the Admiralty Islanders. The nasal index was higher in the Australians than in the Admiralty Islanders, so that whilst the former were platyrhine, the latter were on the line between the leptorhine and mesorhine. In both peoples the orbital index was mesoseme, but in the Admiralty Islanders it was slightly higher than in the Australians, in whom it was on the verge of microseme. The palato-maxillary index was higher in the Admiralty Islanders than in the Australians; in the latter it was dolichuranic, in the former mesuranic.

[1] See Mr. A. H. Keane's Appendix, p. 617, to Wallace's Australasia, already quoted.

But the two races differed from each other in important external physical characters. The hair of the scalp, though black in both, was straight and smooth in the Australian, but fine curly in the Admiralty Islander, and formed in him "a dense mop projecting in all directions 6 to 8 inches from the head." The beard and whiskers were as a rule scanty in the Admiralty Islander, but fairly developed in the Australian. In both, the skin was black or black-brown, though Moseley states that the Admiralty Islander youths of both sexes were as a rule much lighter than the adults, and that he saw one man and two women whose skins were of a light yellow colour. The lips were thick and projecting in the Australians, but not unusually large and prominent in the Admiralty Islanders. Prof. Moseley speaks of a well-marked depression usually present at the root of the nose, so that the brow is somewhat overhanging. From the feeble glabella in most of the crania, granting that they belong to the same race as the living islanders, the projecting brow must be due to thickened skin and subcutaneous tissue, whereas in the Australian it is largely produced by the thickening of the frontal bone. In both races the nose was short and with dilated alæ, but the nostrils were not platyrhine in the Admiralty Islanders, whilst in the Australians the plane of their opening was directed downwards, forwards, and outwards; again, about one in every fifteen or twenty Admiralty Islanders had a long Jewish nose. The conclusion therefore to which one has come from this comparison, is that the Australians and Admiralty Islanders are two distinct races.

I shall now pass to the consideration of the characters of the crania of the people occupying the other islands of the Melanesian area. From its size and importance as the chief seat of the Papuans I shall begin with *New Guinea*.

Material for the determination of the cranial characteristics of the people of New Guinea has been accumulating during the last few years. Though still far from perfect, especially as regards the people of the interior, numerous crania are now in European museums, and a large number have been measured and described. MM. de Quatrefages and Hamy have made a critical examination of the literature of this subject up to the date of publication of their fasciculi on the 'Négrito-Papoue' and 'Papoua' races, and have brought together in a form convenient for reference, a mass of information of which I shall avail myself, though at the same time I shall have to refer to other and subsequent writers and to some specimens not previously described. The north-west end of New Guinea is the part of the island from which the greatest number of crania have been obtained, but the southern seaboard, the south-eastern peninsula, the small islands in Torres Straits, and the course of the Fly River, have also contributed important material.

As a result of the examination of the skulls from these several localities it is evident that a considerable variety in form and proportions has been observed, some being decidedly brachycephalic, others mesaticephalic, others dolichocephalic.

We may first inquire into the evidence which has been recorded of the presence of

brachycephalic and mesaticephalic people either in New Guinea or the adjacent islands. MM. Quoy and Gaimard visited, during the voyage of the "Uranie," the islands of Rawak and Waigiou, situated off the extreme north-west of New Guinea, and gave an account of the people.[1] From their description the crania are short, broad, and high, and they state that their heads are flattened both anteriorly and posteriorly, and in the plate accompanying their description, where two skulls of natives of Rawak are figured, both crania are seen to have well-marked parieto-occipital flattening, and although no measurements are given, they are obviously brachycephalic. MM. de Quatrefages and Hamy have described, in more detail,[2] the crania collected in Rawak and in the adjacent islet of Boni. In one skull the cephalic index was 88, and the average of five skulls was 86, so that their brachycephalic character is unquestionable, whilst the parieto-occipital flattening is strongly marked. The crania observed at Waigiou by the naturalists of the "Coquille" are described as remarkable for a considerable posterior flattening, and, from measurements given by M. Garnot, the cephalic index is 81·8.

In 1856 Prof. Retzius stated[3] that the museum of the Caroline Institute of Stockholm had received from Dr. Wise of Edinburgh three crania of brachycephalic Papuans, which had a striking resemblance to each other and to the crania described by MM. Quoy and Gaimard. MM. de Quatrefages and Hamy have pointed out[4] that the crania collected by Wise were of the tribe of Karons, a people occupying a chain of mountains, originally known as Arfak, in the north-west part of New Guinea, parallel to the north coast and adjacent to Port Dorey. A description of these crania has been given by MM. de Quatrefages and Hamy, one of whom visited Stockholm for the purpose of studying them. Two of these three crania were not flattened in the parieto-occipital region, one of which had a cephalic index of 78·8, the other of 78·3. Their volume was not large, the mean horizontal circumference 492 mm., the capacity 1370 c.c. The antero-posterior maximum of the one 175 mm., and of the other 171 mm. The third specimen had, however, a distinct parieto-occipital flattening, and was obviously brachycephalic. Its antero-posterior maximum was the same as the glabello-iniac, 174 mm., the transverse maximum was 146, and the cephalic index was consequently 83·9. Another cranium, from Amberbaki, adjacent to the country of the Karons, collected by M. Beccari, has been described by MM. Incoronato and Tocco.[5] This skull, apparently that of a woman, had a capacity 1243 c.c., and a horizontal circumference 481 mm. Its antero-posterior max. was only 167 mm., its transverse max. 136 mm., and its cephalic index 81·4.

[1] *Annales des Sciences Naturelles*, t. vii. p. 27, pl. iii., 1826. Figures of one of these skulls are reproduced by von Baer in Crania selecta, pl. iii. figs. 4, 5.

[2] Crania Ethnica, p. 210.

[3] Forhand. ved de Skandin. Naturforsk, Christiania, July 1856; and Ethnologische Schriften, Leipzig, 1864, p. 145.

[4] Crania Ethnica, p. 201.

[5] *Archivio per l'Antropologia*, lib. iv., 1874, and *Boll. della Soc. Geograf. Italiana*, 1874, quoted by de Quatrefages and Hamy, p. 204.

Sandifort has also described[1] a brachycephalic Papuan cranium with a cephalic index of 85, and one with a cephalic index of 83 is in the collection (No. 1401) of Dr. Barnard Davis,[2] but the exact localities from which these skulls were procured does not seem to have been ascertained.

In the magnificent collection of crania formed by Dr. A. B. Meyer[3] certain skulls possessed a high cephalic index. Of the twenty-three crania obtained by him from Rubi, near to the south end of Geelvink Bay, three had the indices respectively of 77·7, 76·4, 76·4 ; and of the one hundred and twelve skulls collected at Kordo, on the island of Mysore, at the mouth of the same bay, several had an index above 75. From an analysis which Dr. Meyer has made of the "normal" series of one hundred and thirty-four crania, one hundred and two have a length-breadth index below 75, twenty-five between 75 and 80, and three only above 80 ; whilst of the adult crania, eighty-six in number, it would appear that of fifty-four males, forty-three had a cephalic index below 75, nine between 75 and 80, and two above 80 ; and of thirty-two females, thirty were below 75 and two between 75 and 80. These "normal" crania gave no evidence of premature ossification of sutures, or of deformity produced by artificial means. They are considered by Dr. Meyer to be Papuans, and not to contain any mixture of Malays ; whilst on Waigiou partially, and on the smaller Papuan islands more to the west, there is, he says, an undoubted mixture of Malays and Papuans.

In 1874 Miklouho-Maclay described[4] three crania, which he had collected in 1872 at the villages of Englam, Mana, and Gumbu on the Maclay coast of New Guinea. He says that the skulls were remarkably brachycephalic, their indices being respectively 81·2, 82·5, and 86·4. In another paper[5] he stated as the result of a great number of measurements that the cephalic index of the New Guinea skulls varied from 62 to 84.[6] Of two skulls collected in Astrolabe Bay on the north-east coast of New Guinea, described by Prof. Virchow,[7] one is said to have a length-breadth index of 78·2, whilst the other is very prognathic, and long and narrow, so that its breadth index is only 72·7. M. Mantegazza has also given evidence of the occurrence of brachycephalic crania amongst the Papuans.[8] These crania, according to him, are small, with large parietal

[1] Tabulæ Craniorum. [2] Thesaurus Craniorum, p. 305.

[3] Dr. Meyer's important memoirs are contained in the *Mittheilungen aus dem k. Zoologischen Museum zu Dresden*, May 1875, October 1876, and December 1878.

[4] Verhand. der Berliner Gesell. für Anthropologie, in *Zeitschr. für Ethnologie*, Bd. vi. p. 177. The name of this Russian traveller is sometimes printed Miklucho-Maclay, at others as in the text.

[5] *Natuurk. Tijdschrift*, Batavia, xxxiv. p. 345, 1874.

[6] In a communication made to the Berlin Society of Anthropology (*Zeitschr. für Ethnologie*, Bd. xii. 374, 1880), and to the Linnean Society of N. S. Wales, *Nature*, vol. xxiv. June 16, 1881, Miklucho-Maclay gives as a result of his travels in Melanesia, that brachycephalism has a much wider range than is usually supposed. He has measured both skulls and heads, and states that the breadth index in many cases exceeds 80 and sometimes 85.

[7] Verhand. der Berlin. Gesell. für Anth., in *Zeitschr. für Ethnologie*, Bd. v. S. 70, 1873.

[8] Studii antropol. ed etnog. sulla Nuova Guinea, 1877 ; Abstract in *Jahresb. der Anat. und Phys.*, 1881, p. 361. In the *Bull. de la Soc. d'Anthrop.*, 19th Feb. 1880, he says that in d'Albertis's collection are skulls of the Negrito type, brachycephalic in proportion.

eminences, and the mean index of eight skulls was 83·1. Of the fifteen crania collected by Dr. Comrie on the south-east coast of New Guinea, thirteen of which are now in the Museum of the Royal College of Surgeons, London, and the measurements of which are given by Prof. Flower,[1] one from Traitor's Bay, near Riche Island, and another from Lydia Island, have cephalic indices respectively 81 and 82·5, whilst a third from the D'Entrecasteaux Islands has an index 77. The two remaining crania were presented by Dr. Comrie to the Anatomical Museum of the University of Edinburgh. The one from Possession Bay has a cephalic index of 68; this skull is markedly dolichocephalic. The other, from D'Entrecasteaux Island, has a cephalic index of 80·5, so that it falls within the numerical brachycephalic index.[2] Three other skulls in the College of Surgeons Museum, one of which is from an island in Torres Straits and two from Airds River, Gulf of Papua, have also brachycephalic proportions.

Brachycephalic crania have also been procured on Warrior Island (l'île Toud) in Torres Straits. I described and figured one with well marked parieto-occipital flattening from this island in 1880,[3] which had a cephalic index 88 and a vertical index 78; and MM. de Quatrefages and Hamy had previously described and figured from the same island crania with brachycephalic proportions. The well-known Italian traveller Signor D'Albertis has figured[4] a number of the skulls which he collected in his expeditions, and these have now been carefully measured and described by MM. Mantegazza and Regalia.[5] Of the twelve crania collected on Kiwai Island at the mouth of the Fly River, ten had a length-breadth index of 76 or upwards, and of these four were upwards of 80, four between 77 and 80, and two between 76 and 77. Of the four crania collected on Canoe Island, a little higher up the same river, three had the cephalic indices 88·9, 85·8, and 80·8, whilst one was 76·1.

From the examination of the living people of New Guinea, made by M. Jacquinot, from the casts of the head taken by M. Dumoutier, from the description of several of the crania given by MM. de Quatrefages and Hamy, from the configuration of the Warrior Islander skull described by myself, from the photographs of a skull from Canoe Island and one from Kiwai in the D'Albertis collection published by MM. Mantegazza and Regalia, there can, I think, be no doubt that the practice of artificially flattening the back of the head, and in the Canoe Island and Kiwai skulls the forehead also, prevails to a considerable extent amongst individuals, and, it may be, also tribes of the natives of

[1] Catalogue of Crania, p. 218, *e. s.*

[2] The measurements of these skulls are given in Table XVI., p. 89.

[3] Two Masks and a Skull from islands near New Guinea, *Journ. Anat. and Phys.*, July 1880, vol. xiv. p. 479. The measurements are given in Table XVI. *supra.* In the British Museum is a prepared and decorated skull marked "Native chief of Nagheer Island, Torres Straits," with a wooden nose, and with the orbits filled up just as in the skull which I have described from Warrior Island. It was flattened both frontally and occipitally, and obviously brachycephalic.

[4] New Guinea, What I did, and what I saw, London, 2nd ed., 1881.

[5] *Archivio per l'Antropologia e la Etnologia*, lib. xi. Fasc. 2, 1881.

New Guinea and the adjacent islets, as far apart as Waigiou and Rawak on the west, Warrior Island on the south, and apparently D'Entrecasteaux Island on the east. At the same time there can be no doubt that this practice does not prevail generally in all the people of New Guinea, as numerous crania of dolichocephalic proportions have been examined in which there is no evidence of artificial parieto-occipital flattening. It should also be stated that many of the skulls possessing high cephalic indices have also been characterised by distinct parieto-occipital or frontal flattening, and the influence which artificial pressure, applied during infancy to the frontal and occipital regions, has exercised either in producing or exaggerating brachycephalic proportions is a factor which should not be left out of consideration in the study of these crania.

The evidence of the presence of a dolichocephalic people in New Guinea is also very complete. MM. de Quatrefages and Hamy have critically examined the older literature on this subject. In the north-west, Port Dorey, Mansinam, Salwatti, the Wandessa tribe of Geelvink Bay, the island of Jobie at the mouth of the same bay, have all furnished crania of these proportions. Dr. Meyer's collection from Rubi, although, as already stated, containing three mesaticephali, had twenty skulls with a length-breadth index below 75. The collection formed by the same energetic naturalist in Kordo, Mysore, had a very large proportion of the skulls dolichocephalic. In his analysis of the eighty-six "normal" adult skulls, Dr. Meyer states that, of the fifty-four males, forty-three were below 75, and of the thirty-two females, thirty were below 75. In the mountains of Arfak also a dolichocephalic people reside, and MM. de Quatrefages and Hamy give, in their twenty-fifth table, 69·3 as the length-breadth index of five males, and 73·9 as the corresponding index of two females. Even on the small Warrior Island dolichocephalic skulls were obtained by the naturalists on board the "Astrolabe" and "Zelée." MM. de Quatrefages and Hamy state (p. 254) that eight crania from this island exhibited purely Papuan characters; seven of these were males, and they have a mean cephalic index of 71·8 and a mean vertical index of 73·3. A ninth skull again gave a mixture of Papuan and Negrito-Papuan characters. The majority of the crania collected by Dr. Comrie during the voyage of the "Basilisk" on the south-east coast of New Guinea were markedly dolichocephalic. Dolichocephalic skulls from Erroob or Darnley Island and from Wallis Island, Endeavour Strait, are in the Museum of the Royal College of Surgeons. The D'Albertis collection of crania, measured by MM. Mantegazza and Regalia, contains twenty-one skulls, thirteen males and eight females, from the interior of New Guinea, collected from houses on the banks of the Fly River; the maximum cephalic index in these specimens was 77 and the minimum 67·7, and both were males; the mean of the series of males was 71·9, that of the females was 72·5. Two male crania from Baduhubere, an inland place to the west of the mouth of the Fly River, had the cephalic index of 66·1 and 75·8. Of the Kiwai group of skulls already referred to (p. 86), only two had a cephalic index below 75, and the lowest index of the Canoe Island group was 76.

The Anatomical Museum of the University of Edinburgh has recently acquired some skulls from New Guinea, to which I may now refer. To the Rev. S. Macfarlane I am indebted for a specimen from Jarvis Island,[1] Torres Straits, and from a former pupil, Mr. A. F. Davenport, I have received two specimens from Tomara, Cloudy Bay, on the south-east coast.[2] The principal dimensions, along with those of the two specimens presented by Dr. Comrie, referred to on p. 86, and the Warrior Islander, are given in Table XVI. The Jarvis Islander and the adult from Tomara were both distinctly dolichocephalic; whilst the young child from the latter place was brachycephalic, and its greater breadth was obviously due to an essential difference in the proportions of the skull, and not to a mere difference in age. In the Jarvis Islander the vertex was roof-shaped. The skull was smeared with a red pigment. A broad tongue of the squamous temporal, 19 mm. in vertical diameter, joined the frontal; the antero-posterior diameter of the temporal fossa was only 102 mm. The vertical and cephalic indices were equal, and there was marked prognathism and an unusually low palato-maxillary index. In the adult Tomara skull a process of the squamous temporal, 6 mm. in vertical diameter, articulated with the right frontal, whilst two epipteric bones were in the left pterion. The Tomara child's skull had a steep descent from the obelion into the occipital region as if from artificial flattening.

There is now on record also a considerable body of evidence to enable one to come to some conclusion as to the relations of the vertical to the cephalic index in the New Guinea skulls. The mesaticephalic Karons tabulated by MM. de Quatrefages and Hamy, in their Table XX., had for the male a vertical index of 74·2 and for the two females a mean vertical index of 75·73, as against the cephalic indices 78·8 and 79·8 respectively. The brachycephali from Rawak and Boni, in the same table, with a mean cephalic index 86·4, had a length-height index 82·7. A brachycephalic skull from Lydia Island, East Cape, Comrie collection, cephalic index 82, had a vertical index 76, and in a D'Entrecasteaux specimen from the same collection (my Table XVI.) these indices were equal. In my Warrior Island skull, and in the brachycephalic specimen in the Paris Museum, the cephalic index was much above the vertical, and these specimens were distinctly deformed from artificial flattening. The brachycephali and four of the mesaticephali from Kiwai and Canoe Island had the vertical index markedly below the cephalic, and in two only of the mesaticephali had the vertical index the superiority. Hence it would appear that in the crania with high cephalic indices the greatest transverse breadth was as a rule in excess of the basi-bregmatic height.

In the dolichocephalic Papuan crania, on the other hand, an opposite condition

[1] This skull was procured from the Sacred House on Jarvis Island. It was probably the skull of a head taken in battle.

[2] These specimens were collected by Lieut. Thos. de Hoghton of H.M.S. "Beagle." They were found in a native's house.

of these indices would appear to prevail. From MM. de Quatrefages and Hamy's twenty-fourth table, which includes Dr. Meyer's Rubi and Kordo crania, along with specimens from Dorey, Salwetti, Wandessa, and Jobie, the mean vertical index, except in the Jobie skull, exceeded the cephalic, and a similar relation is shown in the male Arfaks, though not in the female, measured in their twenty-fifth table. Eight dolichocephalic skulls in Dr. Comrie's collection in the Museum of the Royal College of Surgeons had the vertical index greater than the cephalic, in one it was less, and in two mesaticephali these indices were equal. In three of the five Erroob crania measured by Prof. Flower the vertical index exceeded the cephalic. In the pure Papuan male crania from Warrior

TABLE XVI.—NEW GUINEA.

Collection,	Warrior Island, Torres St.	Jarvis Island, Torres St.	Possession Bay, Dr Comrie.	D'Entrecasteaux Island, Dr C.	Tomara, Cloudy Bay.	Tomara, Cloudy Bay.
Age,	Adult.	Adult.	Adult.	Adult.	Adult.	Child, 6 or 7.
Sex,	M.	M.	...	F.	...	...
Cubic capacity,	1534	1230	...	...	...	1430 *ap*
Glabello-occipital length,	175	178	178	169	179	172
Ophryo-occipital „	173	176	178	170	178	172
Basi-bregmatic height,	137	130	...	136	...	125
Vertical Index,	*78*	*73*	...	*80·5*	...	*73*
Minimum frontal diameter,	103	90	90	96	94	87
Stephanic „	122	105	106	110	104	114
Asterionic „	120	106	101	103	100	108
Greatest parietal breadth,	154	130*s*	122*s*	136*s*	124*p*	142*p*
Cephalic Index,	*88*	*73*	*68·5*	*80·5*	*69*	*82·6*
Horizontal circumference,	515	494	488	489	494	498
Frontal longitudinal arc,	130	122	122	125	118	124
Parietal „ „	135	132	128	138	127	128
Occipital „ „	109	106	...	...	...	108
Total „ „	374	360	...	...	...	360
Vertical transverse arc,	330	280	280	293	277	310
Basi-nasal length,	105	99	...	94	...	90
Basi-alveolar length,	107	108	...	90	...	88
Gnathic Index,	*102*	*109*	...	*96*	...	*98*
Interzygomatic breadth,	140	122	122	128	...	109
Intermalar „	125	113	112	111	...	103
Ophryo-alveolar length,	90	90	89	78	81	73
Naso-alveolar „	65	68	68	60	60	59
Facial Index,	*64*	*74*	*73*	*61*	...	*67*
Nasal height,	47	46	47	46	44	43
Nasal width,	24	24	22	22	25	20
Nasal Index,	*51*	*52*	*47*	*48*	*57*	*46·5*
Orbital width,	...	39	38	37	36	35
Orbital height,	...	29	31	34	33	31
Orbital Index,	...	*74*	*82*	*92*	*92*	*88·6*
Palato-maxillary length,	64	65	58	52	52	45
Palato-maxillary breadth,	69	62	63	66	57	...
Palato-maxillary Index,	*108*	*95*	*108·6*	*127*	*109·6*	...

Island in the Paris Museum, the basi-bregmatic height exceeded the greatest transverse diameter, but in a female skull from the same island the opposite relation occurred. In nine of the thirteen male crania from the inland district of the Fly River collected by D'Albertis the vertical index was above the cephalic, but in three only of the eight female crania did a similar relation prevail.[1]

So far then as one can base conclusions on these characters of the crania, two very distinct types of skulls have been procured in New Guinea, which must without doubt be regarded as indicating the presence in and around that island of more than one race of men. The testimony of several travellers points also to a similar conclusion. The Rev. S. Macfarlane, who for so many years has been engaged in missionary work amongst these people, states[2] that the bush tribes are greatly inferior both mentally and physically to the coast tribes, and that the latter have driven the aboriginal bush tribes into the interior. Signor d'Albertis makes frequent reference[3] to differences which he observed both in the form of the head and in the customs of the people of the interior and those of the coast. He regards it as certain that many races or varieties have come in contact, and that they are more or less mixed in the district of the Fly River. To all appearance the aborigines of New Guinea, who are most numerous and most widely diffused throughout the island, are a dolichocephalic people, constituting the Melanesian or Papuan element, which probably preserves its purity in the interior of the island; though from the great preponderance of dolichocephalic skulls obtained by Dr Meyer from Rubi and Mysore, it is also obvious that there are parts of the coast where skulls of this type abound.

But from its geographical position New Guinea is on the high road between the Pacific and the Indian Oceans, and a stream of migration both from the west and from the east seems to have flowed around its shores. From the east it has received without doubt colonies of brachycephalic Polynesians, who have occupied the Louisiade Archipelago and the adjacent coasts of the main island. From the west it has been, and is indeed at the present day, visited by the brachycephalic Malays for purposes of trade, who have established themselves at Salwatti and the adjacent parts of the west coast. To the west it is also brought into relation with the brachycephalic, short-statured Negrito. In some localities on the seaboard, or the adjacent small islands, immigrant races may have entirely displaced the aborigines; in others it is not unlikely that an intermixture of a foreign with the proper native Papuan race may have taken place, and according to the extent of that intermixture would the physical characters and the customs of the people of the locality undergo a modification. The presence of a Negrito element in New Guinea, more especially in the mountainous district in the north-west, has also been strongly insisted on by MM. de Quatrefages and Hamy, and the brachycephalic Karons (p. 84) are regarded by them as exhibiting characters which closely

[1] See Mantegazza and Regalia's third table.

[2] *Athenæum*, December 2, 1876.

[3] New Guinea, vol. ii.

approximate to the Negrito race. It is of course a question for consideration whether the Negritos or the Papuans are the primitive inhabitants of New Guinea. The Papuans are undoubtedly the more vigorous race, and it is not unlikely that they may have to a large extent displaced and driven to the mountains, or perhaps somewhat intermingled with, a more feeble pre-existing Negrito population.

There is, however, in the study of the crania collected in New Guinea, an element of uncertainty which should not be lost sight of; as, from the practice of head hunting and preserving, it is not possible to pronounce definitely whether those skulls collected by several travellers, which had been preserved as trophies, really belonged to the race occupying the spot where the skulls were obtained, or had belonged to people of some other tribe or race conquered in war. The Rev. S. Macfarlane has given an interesting explanation of how it is that in these trophies the lower jaw so seldom accompanies the skull, for the man who first wounds the enemy gets the one, whilst he who kills and beheads him gets the other. It will require therefore a more intimate knowledge of New Guinea than we yet possess to enable ethnologists to state precisely the exact distribution of the brachycephalic and dolichocephalic races in that island, and this result can only be attained with accuracy when a sufficient number of skulls known to have belonged to the people occupying each district has been obtained.[1]

The Australian race, though separated by a strait only about 80 miles wide at Cape York from New Guinea, has not apparently exercised any influence there. For the northern Australians, although they make canoes, are not a seafaring people, and they are much inferior in civilization to the Papuans. There is indeed one island in Torres Straits, Kowrarega, inhabited according to Macgillivray[2] by a mixed race, formed by a complete fusion of the Papuans with the Australians. The Papuans, on the other hand, do seem to have somewhat modified the characters of the tribes inhabiting the north coast of Australia. Mr. Paul Foelsche, who lived for a number of years in the Northern Territory of Australia, states[3] that the hair of the head of the men is invariably thick and curly, and he has met with instances where it strongly resembles that of the Papuans, but these are very rare. In the women, as a rule, the hair is with few exceptions not so curly as that of the men.

The archipelago immediately to the north and east of New Guinea, of which the Admiralty Islands form almost the western limit, is also inhabited by a Melanesian people.

The people of *New Britain* are, according to Dr. Finsch,[4] pure Melanesians, their hair

[1] Dr. O. Finsch in his Anthropologische Ergebnisse, 1884, expresses his belief that the people of the south-east coast from Fresh Water Bay to Keppel Bay, also those of the islands in Torres Straits, of Saibai Island and of Salwatti in the extreme north-west, are all of the same race, *i.e.*, pure Melanesians.

[2] Voyage of the "Rattlesnake," 1852.

[3] Notes on the Aborigines of North Australia, *Trans. and Proc. of Roy. Soc. of South Australia*, Adelaide, 1882, p. 1.

[4] Anthropologische Ergebnisse einer Reise in der Südsee, Berlin, 1884.

and skin being characteristically Papuan. The Godeffroy Museum in Hamburg contains one hundred and fifty skulls from the New Britain Archipelago, twenty-six of which are from the principal island, New Britain, and one hundred and twenty from the small island Mioko in the Duke of York group. These skulls have been examined and their characters analysed by Dr. Rud. Krause.[1] The chief measurements are as follows:—the mean length 181 mm., maximum 195, minimum 165; the mean greatest breadth 130·9, maximum 142, minimum 119; the mean height 137·6, maximum 150, minimum 128. The indices are as follows:—length-breadth 72·3, length-height 76, breadth-height 105·1. The cubic capacity varies from 1530 to 990, that of the males having a mean of 1267 c.c., that of the females of only 1180 c.c. Prof. Virchow states[2] that he has been put in the position of obtaining through Dr. Finsch one hundred and fifty crania from New Britain. He refers to the great variation in their cubic capacity, and cites a male skull having a capacity of 2010 c.c. and a female of only 1140 c.c., but he gives no other measurements.

New Hanover and *New Ireland*, situated to the north and west of New Britain, were visited in 1875 by the Prussian war-ship "Gazelle," and a description of the people and their customs has been written by Captain Strauch.[3] From the character both of the hair and skin they are evidently in the main Papuans, though it is possible that here, as elsewhere in the Melanesian Islands, there may have been some intermixture of Mahori blood. Numerous crania were collected, which are now in the Anatomical Museum of the University of Berlin. The majority have been measured by Dr. Rabl-Rückhard, and their characters are recorded by him.[4] I am indebted to that gentleman for an early proof of his important communication. The skulls from New Ireland were collected at a spot which had been used for cannibal feasts, and they were so defective that a proper series of measurements could not be taken. Forty-five specimens belonged in all probability partly to New Britain and partly to New Hanover, but in the table of measurements they are all placed under the heading New Hanover. Dr. Rabl-Rückhard has measured the greatest length from both the fronto-nasal suture and the glabella, and has given the cephalic index in relation to both these measurements. When the glabello-occipital diameter is used to compute the cephalic index, I find that by far the greater number of these skulls have a length-breadth index of less than 75, as many indeed as seventeen being below 70, whilst only six are above 75, and the highest of these is 77·6. These people therefore are undoubtedly dolichocephalic. It is also important that in only one instance was the vertical index below the cephalic, and in only one were they equal; in all the other skulls the vertical index exceeded the cephalic, and in many specimens in a

[1] Die ethnographisch-anthropologische Abtheilung des Museum Godeffroy, Hamburg, 1881.
[2] Versamml. der deutschen Anthrop. Gesellsch., 1882, reported in *Archiv für Anthrop.*, Bd. xiv., 1883, p. 89.
[3] *Zeitschrift für Ethnologie*, Bd. ix. pp. 9, 81, 1877.
[4] *Archiv für Anthropologie*, Bd. xv., 1884, parts 1 and 2, supplement.

very marked manner, as may be seen in the following examples:—C.I. 68·9, V.I. 77·6; C.I. 68·1, V.I. 80·2; C.I. 70·5, V.I. 79·3; C.I. 64·9, V.I. 74·2; C.I. 71·3, V.I. 81·3. In this series of skulls Dr. Rabl-Rückhard regards fourteen as men, six as women, whilst the sex of the remaining twenty-five could not be determined with accuracy.

Skulls, preserved heads, and busts from the *Solomon Islands* are in several museums. Mr. Webster describes[1] the natives of San Christoval as almost black, with woolly hair and Papuan countenances. Captain Strauch states that the people who visited the "Gazelle" at Bougainville were well built, extremely dark, with compact hair sticking far out. But mingled with the people possessing Melanesian characters other travellers have seen natives with fairer skins and long smooth hair, resembling the Mahori or Polynesian race.[2] Four busts of natives of the island Isabel are in the Dumoutier collection in the Paris Museum. They exhibit, as MM. de Quatrefages and Hamy have shown, two distinct types; the one brachycephalic, the other dolichocephalic. Prof. Virchow saw on board a ship in Hamburg a native of the island Morissi.[3] His skin was coloured a rich, shining blackish-brown, almost chocolate. The hair of the head was short, frizzly, black, without, however, being arranged in bunches. The length of the skull was 174·5 mm., its greater breadth 145·5, giving an index 80·2.

Skulls or preserved heads are in the Barnard Davis collection, the Godeffroy Museum, the Museum of the Royal College of Surgeons, the Paris Museum, and that of the University of Edinburgh.[4] Of these thirteen specimens, four have the cephalic indices respectively 75, 76·3, 76·5, 79; whilst the remaining eight are below 75, and have a mean length-breadth index 71. In eight specimens the height of the skull has been measured and the vertical index computed. In the skull with the cephalic index 79, from Makira, in the Barnard Davis collection, the vertical index was also 79, and in one from Isabel measured by Prof. Flower the two indices were respectively 75 and 75·6, but in the other specimens the vertical index decidedly exceeded the cephalic. The skulls, though in the main dolichocephalic, yet present individual specimens which approximate to the brachycephalic standard. In this respect the crania bear out the statements of travellers that whilst the people are mainly Papuan, another race is intermingled with them.

New Caledonia lies to the southward of the Solomon Islands, and the people in their hair and skin have strong Papuan features. The Rev. G. Turner says[5] that the people

[1] The last cruise of the "Wanderer," Sydney, 1863, cited in Thesaurus Craniorum.

[2] Die Inseln des stillen Oceans, by Prof. Meinicke, p. 160, Leipzig, 1875.

[3] Verhandl. der Berliner Gesellsch. für Anthrop. in *Zeitschr. für Ethn.*, Bd. ix. p. 241, 1877.

[4] Two preserved heads from Rubiana, a small island about seven miles to the northward of Rendova Bay in New Georgia, one of the Solomon Islands, were presented to me by Dr. J. C. Cox of Sydney, and are now in the Anatomical Museum of the University of Edinburgh. They were procured by Lieut. Farie, who wrote to me that the Rubiana men are fierce and warlike. Probably these heads are trophies, and may have belonged to natives of New Georgia, with whom the Rubianans are frequently at war.

[5] Samoa, a hundred years ago, p. 340, London, 1884.

resemble the Fijians in colour and figure, though the dialects are widely different. Owing to the colonisation of this island by the French, numerous crania are deposited in museums in that country; the Barnard Davis collection contains a few specimens; two specimens were collected by the "Novara"[1] and six specimens are in the Senckenberg Museum in Frankfort.[2] M. Bourgarel has also made a communication on the skulls of these people.[3] Dr. Bertillon has described the crania in the Museum at Caen,[4] and the fine collection in the Museum of Natural History in Paris has been carefully studied by MM. de Quatrefages and Hamy.[5]

The last-named authorities separate the skulls into two groups, those which belong to the Kanala and other tribes living in the north-east of the island, and those from tribes elsewhere, more particularly in the west. The Kanala crania show certain differences in proportion as compared with the tribes in the west. Thus twenty-five males have a mean cephalic index 71·3 and a mean vertical index 75·1, and twenty-six females have a mean cephalic index 74·4 and a mean vertical index 75·5; whilst the more western tribes have in forty-three males a mean cephalic index 69·6, and a mean vertical index 74·4, and twenty-eight females have a mean cephalic index 72·4 and a mean vertical index 74·7. All are dolichocephalic, but this character is more pronounced in the tribes of the west than of the east. In all, the vertical index dominates over the cephalic, and the greater relative height of the skull is more strongly marked in the western than in the north-eastern tribes. These and other differences in the cranial characters of the people in New Caledonia, MM. de Quatrefages and Hamy ascribe to the intermixture of Polynesian immigrants during the last century. Three crania in the Barnard Davis collection from the northern extremity of this island[6] have the following indices respectively—cephalic 72, 72, 78; vertical 74, 85, 80.

The people of the Isle of Pines, a dependency of New Caledonia, are also in the main dolichocephalic. MM. de Quatrefages and Hamy, in their twenty-eighth table, state that seven males have a mean cephalic index 67, and a mean vertical 72·2; six females have a mean cephalic 68·5, and a mean vertical index 73·4. The skull in the Barnard Davis collection, and six specimens in the Museum of the Royal College of Surgeons, are all dolichocephalic, except one specimen, the cephalic index of which is given by Prof. Flower as 76; but in all the height exceeds the breadth. De Quatrefages and Hamy mention that some crania recently received from this island resemble more those of

[1] See Zuckerkandl's Report in Reise der Novara, Anthropologischer Theil. The one which he has measured has a cephalic index 73·4.

[2] See Schaaffhausen's measurements in Supplement to *Archiv f. Anthrop.*, Bd. xiv. The mean cephalic index of the six specimens is 70·4; the mean vertical index 76·2.

[3] *Bull. and Mém. Soc. Anthrop. Paris*, t. i. of each.

[4] *Revue d'Anthropologie*, t. i. p. 250, 1872.

[5] Crania Ethnica, p. 284.

[6] Thesaurus, p. 308, Nos. 682–84.

the Polynesians than those of the Papuans, and they refer to a tradition that some generations ago a small colony of Polynesians settled there.

The *Loyalty Islands* lie a little to the west of New Caledonia. They are for the most part inhabited by Melanesians, though Polynesians have settled there. The Rev. G. Turner says that the people resemble the Fijians. Four crania from the island Maré occur in museums—a female in the Barnard Davis collection, a female in the Museum of the Anthropological Society of Paris, and a male adult and a child in the Anatomical Museum of the University of Edinburgh.[1] These skulls are all markedly dolichocephalic, the mean breadth index is 69, and this dolichocephalic character is quite as strong in the child's skull as in those of the adults. In all the specimens the vertical index was very decidedly above the cephalic.

As no male skull from Maré has yet been described, I shall state briefly the chief characters of my specimen. Its length, narrowness, and relative height are well seen from the measures in Table XVII. The temporal fossa was remarkably elongated, its antero-posterior diameter being 138 mm., and its vertical diameter 88 mm.; this was largely due to the great antero-posterior growth of the parietal bone, the longitudinal arc of which was 150 mm., and even in the child's skull the corresponding arc of that bone was 142 mm. The gnathic index was 103, or just within the prognathic group. The nasal index was mesorhine, the orbital index mesoseme, and the palato-maxillary index dolichuranic. The antero-posterior diameter of the ascending ramus of the lower jaw was very marked, and that of its coronoid process was equally so, obviously in correlation with the great breadth of the temporal muscle. The sigmoid notch was relatively shallow, and there was no disproportion between the coronoid and condyloid height: the chin was almost vertical; the gonio-symphysial length considerably exceeded the intergonial width. Each pterion had a large epipteric bone: small Wormians were in the lambdoidal suture. Indications of an infraorbital suture were on the left side, and the remains of the frontal suture were seen in the glabella.

Many more crania have been obtained from Lifu: two are in the Barnard Davis collection, four in that of the Museum of the Royal College of Surgeons, and twenty-nine in museums in Caen and Paris. The mean measurements of these twenty-nine skulls are given by MM. de Quatrefages and Hamy in their twenty-seventh table. The mean breadth index of eighteen males is 69·8, the height index 73·5; the breadth index of eleven females is 71·8, the height index 74·5. As the measurements of individual skulls are not given, one cannot gather what the maximum indices were in this series, but from Prof. Flower's measurements of the skulls in the Royal College of Surgeons it is clear that Lifu crania may attain a breadth index approaching the brachycephalic, two adults being respectively 78·3 and 78·9, and a child 80·6. Ouvea is said to have been colonised

[1] I am indebted for these specimens to my friend Dr. J. C. Cox of Sydney. Their measurements are recorded in Table XVII.

by Polynesians who migrated there some generations ago, but the three crania in the Natural History Museum in Paris from this island are said by MM. de Quatrefages and Hamy to be strongly Papuan in character, and to have a mean breadth index 68·2 and a mean height index 71·9.

The *New Hebrides, Banks's Islands*, and the *Santa Cruz Islands* form a very extensive archipelago to the north of New Caledonia and the Loyalty Islands. They are inhabited by people varying in stature, physiognomy, and colour of skin; some having strong Papuan characters, but others presenting modifications which point to an intermixture of races. The Rev. George Turner describes the men of Tanna as having less of the negro cast of countenance than some of the other Papuans, but their hair is frizzled; the Erro-

TABLE XVII.—SOUTH SEA ISLANDERS.

	Collection,	Loyalty Islands.		New Hebrides, Erromanga.				Malli-collo.	Solomon Islands. Rubiana.		Ellice group. Hudson Island.
		Maré.	Maré.	F.C.C. Kowiowi.	F.C.C. No. 2.	F.C.C. No. 3.	Dr. H.	E.U. A.M.	E.U. A.M. Head.	E.U. A.M. Head.	F.C.C.
	Age,	Adult.	10.	Aged.	Ad.	Ad.	Ad.	Ad.	...	...	Aged.
	Sex,	M.	F.?	M.	M.	M.	M.?	M.	...	...	F.
	Cubic capacity,	1556	1400	1425	...	...	...	1378	...	...	...
	Glabello-occipital length,	193	181	194	184	194	183	175	180*ap*	188*ap*	188
	Ophryo-occipital ,,	189	181	192	181	187	182	173	...	...	187
	Basi-bregmatic height,	139	133	138	138	...	136	142	...	...	141
	Vertical Index,	*72*	*73·5*	*71*	*75*	...	*74·3*	*81*	...	...	*75*
	Minimum frontal diameter,	93	92	102	98	100	100	100	...	...	100
	Stephanic ,,	105	106	108	114	124	110	114	...	...	116
	Asterionic ,,	112	105	110	...	...	108	114	...	...	115
	Greatest parietal breadth,	132*s*	126*p*	136*s*	132	152*s*	132*p*	132*s*	130	132	144*p*
	Cephalic Index,	*68·4*	*69·6*	*70*	*72*	*78*	*72*	*75·4*	*72*	*70*	*76·6*
	Horizontal circumference,	529	495	560	...	544	512	498	...	...	533
	Frontal longitudinal arc,	127	128	122	133	138	121	123	...	...	134
	Parietal ,, ,,	150	142	138	136	127	138	130	...	...	134
	Occipital ,, ,,	122	108	120	106	...	114	110	...	...	132
	Total ,, ,,	399	378	380	375	...	373	363	...	...	400
	Vertical transverse arc,	303	290	302	...	...	305	312	...	...	332
	Length of foramen magnum,	35	35	36	35	...	34	34	...	...	32
	Basi-nasal length,	103	94	110	104	...	104	108	...	...	104
	Basi-alveolar length,	106	96	106	...	...	103	116	...	...	...
	Gnathic Index,	*103*	*102*	*96ap*	...	...	*99*	*107*	...	...	..
	Interzygomatic breadth,	132	114	137	...	...	...	136	...	...	134
	Intermalar ,,	115	102	120	126	116	...	124	...	...	124
	Ophryo-alveolar length,	85	81	85	...	90	84	81	...	...	...
	Naso-alveolar ,,	66	58	65	...	65	66	65	...	...	...
	Facial Index,	*64*	*71*	*62*	...	...	...	*59*	...	...	...
	Nasal height,	49	45	53	...	48	47	47	...	...	50
	Nasal width,	24	22	28	28	24	25	25	...	...	...
	Nasal Index,	*49*	*49*	*53*	...	*50*	*53*	*53*	...	...	...
	Orbital width,	38	33	42	40	38	39	40	...	...	41
	Orbital height,	34	34	34	30	32	34	29	...	...	33
	Orbital Index,	*89*	*103*	*83*	*75*	*84*	*87*	*72·5*	...	...	*80*
	Palato-maxillary length,	59	51	59	...	...	59	64	...	...	50
	Palato-maxillary breadth,	63	59	...	67	60	63	67	...	...	64
	Palato-maxillary Index,	*107*	*115*	...	...	...	*107*	*108*	...	...	*128*
Lower Jaw.	Symphysial height	33	25	...	...	...	33	30	...	...	...
	Coronoid ,,	67	57	...	...	...	81	66	...	...	...
	Condyloid ,,	63	52	...	...	...	76	60	...	...	...
	Gonio-symphysial length,	101	87	...	...	...	89	101	...	...	...
	Intergonial width,	95	71	...	...	...	99	88	...	...	...
	Breadth of ascending ramus,	45	40	...	...	...	36	46	...	..	...

mangans are a kindred race to the Tannese; a Samoan colony had settled on the island Faté. Up to this time two crania only, from Erromanga, the largest of the southern New Hebrides, have been described, both in the Barnard Davis collection. I have had the fortune to examine four additional specimens from that island, three in the Museum of the Free Church College, Edinburgh,[1] and one from the collection of the late Dr. Handyside, now in the Edinburgh University Anatomical Museum. Their measurements are given in Table XVII. Three of these crania were decidedly dolichocephalic, like those in the Barnard Davis collection, and in each specimen the vertical index exceeded the cephalic. The gnathic index was mesognathous, the nasal index mesorhine, the orbital index microseme. The male skull, Kowiowi, may be taken as typical of these dolichocephalic Erromangans. It was beyond the adult stage, as the sockets of the majority of the teeth were absorbed. It was very massive, for without the lower jaw it weighed 1 lb. 14½ oz. avoir. The glabella, supraciliary and occipital ridges were projecting, and the temporal ridges were double. The antero-posterior diameter of the temporal fossa was 132 mm., and its depth 96 mm. The vertex was roof-shaped. In this and the other Erromangans the frontal diameters were greater than in the Loyalty Islanders. The skull from the Handyside collection was the only one with a lower jaw; the chin was massive and projected forwards, the antero-posterior diameter of the ramus was much less than in the Loyalty Islanders, the coronoid was pointed and with a narrow base, the sigmoid notch was deep, and the gonio-symphysial length was much less than the intergonial width. This skull had also a remarkably long vaginal process ensheathing the styloid. The fourth skull, No. 3 in the Free Church College Museum, had a cephalic index 78, and approached therefore brachycephalic proportions. It belonged obviously to a different type from the others; it was not ridge-like on the summit but well filled, so that the cranial vault was relatively flattened, and the norma verticalis was rounded. The glabella was projecting. There was no evidence of artificial flattening either in the frontal or occipital regions.

Three crania from Tanna are in the Barnard Davis collection and one in the Museum of the Royal College of Surgeons. Their respective cephalic and vertical indices are C.I. 85, V.I. 83; 77, 85; 72, 72; 75, 75.[2] The Barnard Davis collection also contains a skull from Aneitum, C.I. 68, V.I. 73. The Museum of the Royal College of Surgeons has a skull from Ambrym, C.I. 70·2, V.I. 75·1; one from Cherry Island, C.I. 77·7,

[1] I am indebted to Prof. Duns, D.D., for the opportunity of studying these crania, as well as the one from Hudson Island, Ellice group, in the same museum, referred to on p. 103. One of the three Erromangan skulls is especially interesting. It is that of Kowiowi, the leading actor in clubbing to death the Rev. John Williams. Kowiowi was under chief at Bunker on Dillons Bay at the time of the murder in November 1839. Accompanying the skull was a letter to Dr. Duns from the donor stating how and by whom the skull was obtained. The Erromangan skull from Dr. Handyside's collection is also said to have belonged to one of the men who killed Williams. This skull has, however, some feminine characters, which make its sex doubtful. A slice had been taken out of the parietal bone as if with a tomahawk.

[2] For further measurements and indices see the Thesaurus Craniorum and Prof. Flower's Catalogue so often cited.

V.I. 86·9; two from Banks's Islands, C.I. 73·3, V.I. 73·3; C.I. 80, V.I. 78·8. In the same museum are two from Api, and in the Barnard Davis collection is one from the same island, the indices of which are C.I. 73·8, V.I. 73·3; C.I. 77·5, V.I. 81·1; C.I. 66, V.I. 76. Ten crania from Faté are in the Barnard Davis, College of Surgeons, and Paris Museums. MM. de Quatrefages and Hamy give the mean C.I. of five males as 68·4, the V.I. 73·6; the C.I. of one female 20·2, the V.I. 77·7. The Barnard Davis specimens are respectively C.I. 65, 69, 80; V.I. 75, 77, 77. Three skulls from Vanikoro have been carefully described, and one of them figured by Mr. G. Busk.[1] The cephalic indices are respectively 70·4, 71, 71, and the vertical indices 80, 84·4, 82·6. The height of these skulls is, as Mr. Busk points out, very remarkable. The gnathic index is not as a rule very pronounced. Mr. Busk also recognises the general preponderance in length of the parietal longitudinal arc over the frontal.

From the observations of MM. Quoy and Gaimard on the "Astrolabe"[2] and of those of M. P. A. Lesson, the people of Vanikoro are Papuans, though Lesson states[3] that they are more or less mixed with a yellow Polynesian race. A single skull from the island of Espiritu Santo is in the Godeffroy Museum. Krause gives the length 184 mm., breadth 138, height 139; the cephalic index is 75, the vertical index 75·5.

Much light has of late years been thrown on the skulls of the people of Mallicollo, one of the northern New Hebrides. The collection of eight crania in the Museum of the Royal College of Surgeons described by Mr. Busk,[4] the series of monumental heads and deformed skulls in the same museum described by Prof. Flower,[5] and the sixteen crania in the Godeffroy Museum of which Dr. Krause has given an account,[6] have supplied interesting material for study. The people of this island are distinctly Papuan in their external characters, but amongst them the practice of artificially deforming the head by pressure applied to the frontal region during infancy extensively prevails. This practice of course affects the measurements, but when allowance is made for the change in form produced by pressure, the skulls are without doubt dolichocephalic. In Mr. Busk's series the breadth index varied from 68 to 74, and four of the skulls were below 70. The height index in each skull was with one exception above the breadth index. The mean length of the skulls in the Godeffroy Museum was 181·8 mm., the maximum 195, the minimum 164; the mean breadth was 127 mm., maximum 135, minimum 122; the mean height was 138 mm., maximum 147, minimum 125. The mean indices were as follows—C.I. 69·8, V.I. 76. In the Anatomical Museum of the University of Edinburgh is a skull marked "Mallicollese," which was purchased many years ago from a sailor by the late Prof. Goodsir. It showed no flattening in the frontal region, but had been markedly flattened and rendered unsymmetrical behind by pressure in the parieto-occipital region. The

[1] *Journ. Anthrop. Inst.*, vol. vi. p. 200, 1877.
[2] Voyage de l'Astrolabe, Hist. vol. v.
[3] *Revue d'Anthropologie*, t. v. p. 257, 1876.
[4] *Journ. Anthrop. Inst.*, vol. vi. p. 200, 1877
[5] *Journ. Anthrop. Inst.*, vol. xi., 1881.
[6] *Op. cit.*, p. 616.

highest part of the skull was about midway between the bregma and obelion, and the height from the plane of the foramen magnum to the summit was 5·4 inches. The antero-posterior diameter of the temporal fossa was 117 mm., being materially below that of the Erromangans or Loyalty Islanders. The measurements are given in Table XVII.; C.I. 75·4, V.I. 81. Prognathism was very marked and the palato-maxillary region was one of the longest that I have measured. Traces of the frontal suture extended through the glabella into the ophryon. A large epipteric bone existed on each side; Wormian bones were in the lambdoidal suture, and a suture passed from the infraorbital foramen into the floor of the orbit. The antero-posterior and transverse diameters of the foramen magnum were equal. The lower jaw had a wide ramus, a broad-based coronoid process, and a shallow sigmoid notch. From Prof. Flower's description and figures it is evident that the artificial flattening of the head in the Mallicollese is not limited to the frontal region, but that in some cases pressure is applied to the back of the head. This is corroborated by the specimen I have now described.

The *Fiji Archipelago* forms the north-eastern group of islands of the Melanesian region. They are inhabited by a race possessing well-marked Papuan characters, but colonies of the brown Polynesians from Samoa and Tonga have established themselves in many of these islands, especially on the sea-coast.[1] The best collections of skulls from Fiji are in the Godeffroy Museum, which possesses seventy-four crania; the Museum of the Royal College of Surgeons, with twenty-four specimens; the Natural History Museum in Paris, with fifteen specimens; and the Barnard Davis collection, with ten specimens. Other museums also contain individual crania.

A skull of brachycephalic proportions, cephalic index 84·2, from the Fijian island Moutouata is in the Army Museum of the United States.[2] A few mesaticephalic crania from the islands Mango, Vanua Balavu, Vakaia, Moturiki, Kandavu, Dzizia, and Ovalau, varying in their cephalic indices from 75·1 to 79·2, have been recorded by Barnard Davis, Flower, Krause, de Quatrefages with Hamy and Rabl-Rückhard; but skulls of these proportions are quite exceptional. The great majority of the Fijian skulls which have been measured are dolichocephalic, and as a rule so long and narrow that the term stenocephalic has been applied to them. A most careful description, with figures, of a series of sixteen crania of the Kai Colos, or natives of the mountains of the interior of Viti-Levu, has been given by Prof. Flower.[3] The breadth index was in each skull below 70, and the height index in each specimen was markedly above that of the breadth. Dr. Krause gives the following numbers as the mean measures of the skulls in the Godeffroy Museum obtained from the following islands:—Viti-Levu, C.I. 67·6, V.I. 75·1; Moturiki, C.I. 68·8, V.I. 75·2; Ovalau, C.I. 69·1, V.I. 76·1. The people of Mango

[1] Die Inseln des stillen Oceans, by Prof. Meinicke; also Wallace's Australasia.

[2] Referred to by de Quatrefages and Hamy, p. 291.

[3] Cranial Characters of Natives of Fiji Islands, *Journ. Anthrop. Inst.*, vol. x., November 1880.

have a mean C.I. 73·2, V.I. 77·3; those of Oneata, C.I. 74·6, V.I. 78·8, so that, as both Flower and Krause have pointed out, the dolichocephaly diminishes in the eastern islands, *i.e.*, in those in closer proximity to the Tonga Archipelago, and a transition is established between the stenocephalic western Fijians and the brachycephalic Tongans, due without doubt to an intermixture of the two races.

From the observations of the several craniographers to whose labours I have had so frequently to refer in the course of this comparison, the conclusion has been drawn that the skulls of the Melanesians are distinctly dolichocephalic, and this conclusion has been confirmed by the additional observations recorded in this Report. But further, it has been shown that the height of the Melanesian skull exceeds its breadth, so that the vertical index is greater than the cephalic. The presence of a people in some of the islands in the Melanesian area in whom the skull is remarkably long, narrow, and high, was especially pointed out by Dr. Barnard Davis, and the skulls of this form were named by him hypsistenocephalic.[1] He describes the people of New Caledonia, the New Hebrides, the Loyalty Islands, probably the Fijians, and perhaps some of the Caroline Islanders, as possessing skulls of this form. The correspondence of the crania of the people of Vanikoro with this type was pointed out by Mr. Busk. Prof. Flower states that the skulls of the Kai Colos, or mountaineers of Fiji, belong to the most pronounced hypsistenocephalic type, and the skulls of the Loyalty Islanders described in this Report are characteristic examples.

Although both the Admiralty Islanders and the dolichocephalic people of New Guinea agree with the people named in the last paragraph in having a vertical index greater than the cephalic, yet, if one place side by side the Loyalty Islander skulls, the drawings of the Fiji mountaineers published by Prof. Flower, the New Guinea skulls from Jarvis Island, Tomara, and Possession Bay (Table XVI.), and the Admiralty Islander crania, the Fijians and Loyalty Islanders can be at once distinguished from the New Guinea and Admiralty Islanders. The Fijians, Loyalty Islanders, and New Hebrideans have larger and more massive crania than the others, and belong evidently to a people physically stronger. But the differences in the two groups can be more definitely brought out by comparing my measurements of the Admiralty Islanders with those of the Fijian mountaineers made in an almost similar manner by Prof. Flower.

The Fijian skulls are remarkably dolichocephalic, for the mean cephalic index of eleven specimens (six males, five females) is only 66, whilst that of the Admiralty Islanders is 70. This low latitudinal index, whilst showing a material difference in the relations of length and breadth in the two series of crania, yet does not express all their differential characters in these dimensions. For whilst in none of the Admiralty Islanders does the glabello-occipital diameter exceed 186 mm., and in five specimens falls below 180, in the

[1] Peculiar Crania of Inhabitants of certain groups of islands in the Western Pacific, *Natuurk. Verhand. Holland. Maats. Wetensch.*, Haarlem, vol. xxiv., 1866. See also *Anthropological Review*, vol. iv. p. 48.

shortest of the Fijian skulls (two females) it is 182, whilst six specimens (all males) are 190 or upwards. In their greatest transverse diameters the two series of skulls much more closely approximate, for whilst the average of the twelve Admiralty Islanders is 128 mm., that of the eleven Fijians is 126. The Fijian skulls are therefore not only relatively but absolutely considerably longer than the Admiralty Islanders. The crania also exhibit differences in the altitudinal or vertical index, for whilst the average height of the Admiralty Islanders is 131 mm., that of the Fijians is 140. In consequence, therefore, of this predominance in length and height, the Fijian skulls possess a considerably greater cubic capacity, the average of which in the males is 1504 c.c., in the female 1327 c.c., so that their female average is somewhat higher than that of the males and females collectively in the Admiralty Island series.

All the Fijian skulls are strongly phænozygous. In the Admiralty Islanders, notwithstanding the broken zygomatic arches in several specimens, the skulls are as a rule manifestly cryptozygous. In the degree of prognathism the two series of crania closely correspond, for the average gnathic index in the Admiralty Islanders is 103, and that of the Fijians is 103·7. A marked difference, however, is to be seen in the relations of the length and breadth of the nasal aperture, for whilst the breadth is more than half the height in the Fijians, in whom the average nasal index is 56·6, and all the specimens, with one exception, belonged to the platyrhine group, only four of the Admiralty Islanders are platyrhine, six are leptorhine, and the general average is on the line between the leptorhine and mesorhine groups. The mean orbital index in the Admiralty Islanders is about the middle of the mesoseme series, and alike in the two sexes; whilst in the Fijians it shows a marked difference in the males and females. For in the males it is on the average 84·2, or barely within the mesoseme series, whilst in the females it is 90·7, or distinctly megaseme. In the form of the palato-maxillary region the two series of skulls are much alike, for the mean palato-maxillary index in the Admiralty Islanders is 112, and in the Fijians it is 111; so that they are both mesuranic.

In conclusion, whilst both series are markedly dolichocephalic, the latitudinal index is much lower, the altitudinal index is much higher, and the cranial capacity is greater in the Fijians than in the Admiralty Islanders; the Fijians are phænozygous, platyrhine, mesoseme in the males and megaseme in the females; the Admiralty Islanders are, as a rule, cryptozygous, lepto-mesorhine, and mesoseme. The two series of crania, however, closely correspond in the degree of prognathism and in the form of the palato-maxillary region.

The question therefore arises, are the people with hypsistenocephalic crania to be regarded as a different race from the other dolichocephalic people inhabiting the Melanesian region? Dr. Barnard Davis is evidently inclined to the opinion that they are a different race, but this opinion is not shared by ethnologists generally. Neither does the evidence which has been advanced in its support seem to me to be conclusive. For, as Dr. Davis himself admits, crania in which hypsistenocephalism exists do not all exhibit

it in the same degree. Crania pass by almost insensible gradations from the extreme form seen in Fiji or the Loyalty Islands to skulls which are of the New Guinea or Admiralty Island conformation. The hypsistenocephalic character seems to be an exaggeration of the Melanesian type, fostered perhaps by tribal interbreeding and hereditary descent amongst those who inhabit the mountainous regions, and those who have had little communication with the people of adjacent islands; whilst in the inhabitants of the sea-coast, more liable to intermixture, the type form has not assumed such exaggerated proportions, or perhaps has become altered by mingling with other races.

We may now pass to the consideration of the area occupied by the Mahori or brown Polynesian race. Ethnologists generally look to the Samoan and Tonga Islands as the central home of this race in the Pacific, from which it has diffused itself in several directions.[1]

The *Tonga Islanders*, so far as their skulls have been examined, are almost purely brachycephalic. Three adults measured by Prof. Flower are distinctly so, and six adults in the Godeffroy Museum, measured by Dr. Krause, are wholly so, with one exception, and that is mesaticephalic. The mean of the eight brachycephali is 84·5, and the range is from 80 to 89·4. Some children's skulls from the Tonga Islands have a cephalic index of 90·6 and 92·9. Krause states that the skulls of the Tonga Islanders have a high, steep, broad forehead, flat and deeply descending occiput, parietal tubera laterally projecting, broad face, large eyes and little prognathism.

The *Samoan Islanders* are not so uniformly brachycephalic. Two crania in the Museum of the Royal College of Surgeons are undoubtedly so, C.I. 80·6 and 89; but only three out of thirteen skulls, mostly from Upolu, in the Godeffroy Museum have a cephalic index above 80; four are below 75, whilst six are mesaticephalic; but of those, five are above 77, so that they approach the brachycephalic standard. It would look therefore as if a certain Melanesian admixture with the Polynesian people had taken place in Upolu. The vertical index in the Samoan dolichocephali was as in the Melanesian race distinctly higher than the cephalic. Whereas in the brachycephali the vertical index, though occasionally above the cephalic, as a rule was not so, and in some instances was markedly below it. Krause gives the cephalic index of a skull from the small island Futuna as 87, and Flower that of a native of Savage Island(Niuë), lying midway between the Tonga and Samoan groups, as 83·8. The Rev. G. Turner states that Savage Island is populated by light copper coloured natives very like the Samoans, and that their dialect is a mixture of Samoan and Tongan; but Mr. W. L. Ranken, although recognising their Samoan affinities, considers that there is also an intermixture of Papuan traits.

Crania of the *Ellice Islanders*, to the north-west of the Samoan Islands, are very

[1] See the accounts of the Samoans by the Rev. S. Whitmee (*Contemporary Review*, February 1873); Mr. Pritchard and Mr. W. L. Ranken in *Journ. Anthrop. Inst.*, vol. vi. p. 224, and Rev. G. Turner in "Samoa," London, 1884.

sparingly represented in our museums. Prof. Flower gives the cephalic indices of two specimens from Nanumea as 81·2 and 77·5, and their vertical indices 76·8 and 75·3. Dr. Krause has measured one from Niutao, with C.I. 83·2, and V.I. 76·5. In Table XVII. I have given the measurements of a skull in the Museum of the Free Church College from Hudson's Island in the Ellice group. This skull was apparently that of a woman well advanced in years, for the sutures of the cranial vault were almost obliterated. The cephalic index was 76·6 and the vertical index was only 75. In its configuration this skull closely resembled the mesaticephalic Erromangan described on p. 97, and like it was probably a cross between a Melanesian and a Mahori. The breadth of the palate greatly preponderated over the length, so that the palato-maxillary index was unusually high. The Rev. G. Turner says,[1] that tradition traces the origin of the people of Hudson's and the other islands of the Ellice group to Samoa.

Hervey's or Cook's Islands have apparently contributed only two skulls to museums. The one from Mungaia in the Barnard Davis collection is distinctly dolichocephalic, and has C.I. 70, V.I. 76; the other from Rarotonga, in the Godeffroy Museum, has very different proportions, and is very brachycephalic, C.I. 86·4, V.I. 79; Krause also states that it is strongly prognathic. This difference in the cranial proportions is in accordance with what has been said as to the physical characters of the people of these two islands. For Rarotonga "is inhabited by people who have legends of their migration from Samoa and speak a closely allied language;" whilst in Mungaia the "Melanesian type predominates, the people being dark brown, with wavy or frizzled hair and well bearded."[2]

The *Society Islands* are represented by at least thirty crania, twenty-three of which are in the Natural History Museum, Paris, and the remainder in the Godeffroy Museum, the Barnard Davis collection, the "Novara" collection and the Museum of the Royal College of Surgeons. The mean cephalic index of these series of skulls is 77; the maximum being 79·6, a skull from Tahiti; and the minimum 74, a skull from Raiatea. The vertical index in these specimens is as a rule higher than the cephalic. Tradition points to these islands as having been settled from Samoa.

The *Low or Paumotu Archipelago*, to the immediate south-east of the Society Islands, has contributed a number of crania, the majority of which are in the Paris Museum. MM. de Quatrefages and Hamy state that these islanders have crania which are generally like those of the Society Islanders, but they do not record any measurements. Dr. Krause gives the measurements of two specimens from Tipoto and Niau in the Godeffroy Museum, the cephalic index of one is 76, that of the other 76·3. Another specimen from Bligh Island is described by Zuckerkandl,[3] who places the breadth index at 70·8. He says that the specimen is stenocephalic, and differs from the skulls of other Polynesians

[1] Samoa, pp. 288, 293, London, 1884.
[2] W. L. Ranken in *Journ. Anthrop. Inst.*, vol. vi., 1877, and Wallace, Australasia, p. 507.
[3] Reise der Novara, Anthropologischer Theil, p. 111, 1875.

to which he has had access. The skull of a Gambier Islander, one of the southern islands of this archipelago, in the Barnard Davis collection, has a cephalic index 72 and a vertical index 79. Mr. Ranken states that the natives in the Paumotus show some evidence of a people having been there prior to the Mahori occupation, and that they have a number of words not traceable to any Mahori dialect.

Crania of the *Marquesas Islanders* are abundant in the Barnard Davis collection and in the Paris Museum, the Godeffroy Museum also contains four examples. Of the thirty-six specimens in the Barnard Davis collection fourteen had a cephalic index of 80 or upwards, fifteen were from 75 to 80, and seven were below 75. In the brachycephali the vertical index was as a rule below the cephalic, in the dolichocephali it was as a rule above it, whilst in the mesaticephali it was sometimes above, at others below. Of the four specimens in the Godeffroy Museum, one was brachycephalic and three were mesaticephalic. MM. de Quatrefages and Hamy do not give the measurements of the individual crania in the Paris Museum, but they place the mean of twelve crania of the Teïs from the environs of Fort Collet at 79·4, whilst eight crania from Tahou-Ata have a mean cephalic index of 75·3. It is obvious therefore that a considerable diversity exists in the cranial proportions of the natives of this group as well as in the separate islands. Thus the skulls from Nuka-hiva in the Barnard Davis collection varied in the cephalic index from 69 to 83; those from Fatu-hiva varied from 70 to 86; those from Ohivaoa from 74 to 84; and those from Uahuga from 76 to 82. The series from each of these islands, therefore, excepting the last, contained skulls possessing dolichocephalic, mesaticephalic, and brachycephalic proportions. Two crania from Nuka-hiva were also collected by the "Novara";[1] the one had a cephalic index 73·5, the other 79·5.[2] Tradition points to the colonisation of these islands from the Samoan group.

The *Sandwich Islanders* present great diversities in the proportions of the crania, as I have already pointed out in a previous section of this Report (p. 62, *et seq.*), so that the thirty-six adult crania varied in the cephalic index from 71 to 86; and of these ten were upwards of 80, eleven were from 75 to 79 both inclusive, and fifteen were below 75. As it happened the four skulls from Hawaii were all brachycephalic, but the thirty-two from Oahu presented examples of each of the three divisions of the length-breadth index.[3] My measurements of the skulls from Oahu are generally in accordance with those made by Dr. Barnard Davis on a still larger collection from that island presented to him by W. L. Green, Esq. A reference to the measures recorded in the Thesaurus Craniorum will show that his collection of upwards of one hundred skulls varied in the cephalic index from 69

[1] See Zuckerkandl's description, and pls. xvi., xvii., and xx.

[2] Blumenbach has also figured a Marquesan cranium. Plate L. Decas quinta.

[3] A description of the burying ground at Waimanalo, Oahu, from which Mr. Moseley obtained the skulls described in this Report (p. 62), has also been given by Dr. Finsch, *Zeitschr. für Ethnol.*, Bd. xi. p. 326, 1879. Dr. Finsch considers that the skeletons found there are pure Hawaians, belonging to a period free from European influence, as this part of the coast has not been disturbed by white people.

to 90. Sixty specimens had a cephalic index of 80 or upwards; twelve were below 75, and the remainder were from 75 to 79 both inclusive; the brachycephali were, however, present in a larger proportion than in my series from the same island. Six skulls from Hawaii in the same collection varied in the cephalic index from 72 to 86, and of these, four were 81 or upwards. Dr. Davis gives the mean C.I. of the entire series of Sandwich Islanders in his collection as 79 for the men and 80 for the women. Of the four skulls from Hawaii in the Museum of the College of Surgeons, two had the cephalic index 81·7, 85·7; the other two were 69·5 and 71·8. MM. de Quatrefages and Hamy give the mean cephalic index of fifteen male Sandwich Islanders as 75·5 and of seven females as 78·4. They also refer to a large collection from the islands Maui and Kauai measured by M. Otis, the mean breadth index of ninety-seven men being 81·3, and of forty-one women being 80·5. As the measurements of the individual skulls are not given by these last named craniologists, I am not able to say what is the range of variation in their respective series. It is well known that the practice of artificially flattening the back of the head prevailed to some extent amongst the Sandwich Islanders, and I agree with MM. de Quatrefages and Hamy that this will necessarily have the effect of somewhat raising the cephalic index of the skulls in which this deformation exists. In my series of skulls the relation of the vertical to the cephalic index varied with the cephalic index. In the brachycephali and almost all the mesaticephali the vertical index was less than the cephalic, whilst in a considerable number of the dolichocephali the vertical index exceeded the cephalic. The former therefore corresponded in this relation with the Polynesian, the latter with the Melanesian character.

Retzius, from the study of a Sandwich Island skull in his collection, and of a number of Polynesian skulls which he saw in London, came to the conclusion that they were one of the highest members of his brachycephalic prognathic class, and formed a transition from this to the dolichocephalic.[1] Dr. Uhde has also described four crania from Oahu,[2] three of which came from a battlefield on the plain of Kulau, and one from the neighbourhood of Diamonds-hill on the south-east coast. He recognises such differences between them as to place two in Retzius's *dolichocephalæ prognathæ* and two in his *brachycephalæ prognathæ*.

There is thus abundant evidence to show that the crania of the Sandwich Islanders are by no means homogeneous in their characters, but present wide differences in form and proportions, and in this respect they agree with the Marquesas Islanders. To what are these differences to be ascribed? The most rational conclusion I think will be that they express the presence in these islands of more than one race of men. Captain Cook refers to the fine physique of the chiefs and their superiority to the natives generally.

[1] Ethnologische Schriften, p. 65; and *Müller's Archiv, Anat. u. Physiol.* 1874.

[2] *Nova Acta Acad. Nat. Cur.*, vol. xxviii., 1861.

M. Choris also speaks[1] of these differences between the chiefs and the common people, and further points out that in some the hair is crisp or frizzled, approaching to a woolly appearance, in others it is soft and flexible; the skin also differs in colour from yellow to a rich brown. Dr. Bielitz, quoted by Uhde, also states that the chiefs of the Sandwich Islands differ remarkably in size, strength, colour, &c., from the common men, which led him to conclude that two different races existed there. There is thus a concurrence of opinion amongst travellers of such differences in the external characters of the people as would point to the presence of both a Polynesian and a Melanesian element, and these differences are supported by their craniology. Where but little intermarriage had taken place between the two races, each would preserve its purity of type, but with an intermixture then the two races would be more or less fused with each other. The traditions of the Sandwich Islanders point to Tahiti the largest of the Society Islands as the place from which they came, and it is not unlikely that these Polynesian adventurers when they landed on Oahu and the other Sandwich Islands found a Melanesian people living there.

New Zealand, with its outlying dependency the *Chatham Islands*, has been generally regarded as inhabited by the Polynesian race. Owing to the English colonization numerous crania have been collected, more especially from New Zealand, and are now in museums.

The measurements of fourteen skulls from the Chatham Islands in the Barnard Davis, College of Surgeons, Godeffroy, and Paris Museums, and in the collection formed by the "Novara," have been published, and to these may now be added the nine skulls described in this Report. The cephalic index varied greatly in this series of twenty-three skulls. If I exclude the child's skull, measured by Barnard Davis with an index of 89, the crania varied from 72 to 83, and presented examples of dolichocephalic, mesaticephalic, and brachycephalic crania; two were 80 or upwards, four were below 75, and sixteen were from 75 to 79 both inclusive, the preponderance therefore being decidedly in favour of those with intermediate proportions. The mean cephalic index of the series was 76. In the few skulls with a high cephalic index the height was less than the breadth, but it is also to be noticed that even in the skulls with a low breadth index, the vertical index was as a rule below the cephalic. The crania also were not prognathic, and although the average of Prof. Flower's series of five skulls was somewhat above mine, yet his are only mesognathous. De Quatrefages and Hamy refer to the cubic capacity of the crania of the Chatham Islander men as being exceptionally large, but this was not the case in my specimens, in which the mean of the series was the same as that of the New Zealanders.

The New Zealand crania are much more numerous in museums than the Chatham Islanders. In addition to the twenty-one specimens described in this Report, the Barnard

[1] Quoted by Prichard in *Natural History of Man*, vol. ii., p. 440.

Davis collection contains nine specimens, the Museum of the College of Surgeons at least thirty, the Natural History Museum in Paris possesses upwards of thirty skulls, the Godeffroy Museum three ; eight are described in the account of the "Novara" Expedition,[1] whilst individual specimens are in the Berlin and other museums. MM. de Quatrefages and Hamy do not give the measurements of the individual skulls in the Paris Museum, but only the average ; they place the cephalic index of fifteen men at 73·26, that of fifteen women at 72. More detailed measurements of seventy-two specimens are, however, given by Barnard Davis, Flower, Zuckerkandl, Krause, Rabl-Rückhard, and myself, from which I gather that only five specimens had a cephalic index of 80 or upwards; forty-one were below 75, and twenty-six between 75 and 79 both inclusive. The mean breadth index of the entire series was 74. The New Zealanders therefore incline to dolichocephalism, and at least four are recorded with a breadth index below 70.[2] Not unfrequently in the skulls with the lower cephalic index the vertical index exceeded the cephalic, but there were so many exceptions that it cannot be regarded as the rule in them for the basi-bregmatic height to exceed the greatest breadth. The crania are not characterised by any marked projection of the upper jaw. The mean of my series, as already stated, was orthognathic, the mean of Prof. Flower's measurements places his series of skulls on the verge between orthognathism and mesognathism.

The traditions of the New Zealanders, the study of their language by several philologists,[3] and the observations on their external characters by Captain Cook and other voyagers have all combined to the conclusion that the Maoris are an offset of the great Polynesian race, and their traditions point to Samoa as the group of islands from which they had sprung. If this view of their origin be correct, then we should expect that their cranial characters would correspond with those of the people from whom they had originated. It is of course impossible to state with any precision at what date they had separated from their parent stock and settled in New Zealand, but this must have happened a number of centuries ago. We have already seen that the Polynesians living in the islands nearer to the equator, although they possess a large percentage of brachycephalic heads, yet have intermingled with them skulls of mesaticephalic and dolichocephalic proportions. To some extent this is doubtless in part due to comparatively recent intermixtures of the Melanesian and Polynesian races. But if, as I shall attempt to show immediately (p. 110), a Melanesian people had inhabited Polynesia prior to its colonisation by the yellow brown race, and had to some extent fused with it, then the New Zealand colonists would not have been pure Polynesians, but would have had a

[1] Zuckerkandl, *op. cit.*

[2] The remarkably elongated skull in the Museum of the College of Surgeons, with an index of only 62·9, described by Prof. Huxley in his paper on two widely contrasted skulls (*Journ. Anat. and Phys.*, vol. i. p. 60, 1867), and which he thought might be a New Zealander, is now regarded by Prof. Flower (New Cat., p. 216) as more probably from the New Hebrides. It is not included in the above summary.

[3] *The Transactions of the New Zealand Institute* contain many valuable and instructive papers on the origin of the Maoris.

certain admixture of Melanesian blood. But, on the hypothesis of a general diffusion of the Melanesian stock over the Pacific Islands, it is possible that New Zealand may have been inhabited by people of that stock prior to the Polynesian invasion, and in consequence a still further dilution of the Polynesian characters, either in particular localities or pretty generally throughout the island, may have taken place by interbreeding between the two races.

In support of this hypothesis I may refer to the accounts which have been given of the external appearance of the Maoris, from which it is clear that considerable differences have been observed in their hair and features. The skin varies in colour from a clear olive brown to an opaque black-brown. The hair is brown, or black, or even reddish, and straight or curly; the beard is often well-grown and bushy.[1] The features are sometimes coarse, with thick lips and broad noses, at others much more delicately moulded. Their crania also exhibited many variations from the Polynesian type. As already stated (p. 107), but a small percentage were brachycephalic, whilst a large proportion were dolichocephalic, and the mean cephalic index of the series of seventy-two skulls was 74, which places them just below the mesaticephalic minimum. It is clear therefore that there is a strong tendency in the skulls of this people to assume dolichocephalic proportions, and thus to depart from a pure Polynesian type, much more strongly than is the case with the Samoans, the Marquesas Islanders, or even the Sandwich Islanders. It would be interesting to inquire whether marked differences exist in the form of the skull in different districts, and whether there are equally marked variations in skulls from the same district. Unfortunately the collection on which I have reported does not enable me to go very completely into such an inquiry, but I may point out that the six crania from Kapiti Island, all apparently from one tribe, varied in the cephalic index from 67 to 78 amongst the adults, and in a child rose to 82, whilst the vertical index varied from 69 to 76, and that considerable differences existed in the nasal, orbital, and palato-maxillary indices.[2] The skulls from near Auckland also varied in their cephalic index, so that it would seem as though considerable differences in this respect may occur in people of one and the same tribe.[3] The conclusion therefore to which I have come from the consideration of these

[1] In the Anatomical Museum of the University of Edinburgh are four tattooed and preserved heads of New Zealanders. In one the hair was jet black, long, closely set, thick and wavy. This man also had a short-clipped thin moustache and a moderate beard, the hairs of both of which were brown and brownish-black. In the second the hair was long, black and straight. He had a short thin brown moustache and a tuft of hair at the chin. In a third the hair was reddish-brown and straight, long at the back and short at the front of the head. In the fourth the hair was brown-black, and arranged in spiral tufts, the hairs of which, when straightened out, were five or six inches long. These tufts were separated from each other by intermediate portions of scalp, from which the hair had been cut quite close to the skin. The tufts were therefore isolated from each other by the cutting away of the intermediate patches of hair.

[2] MM. de Quatrefages and Hamy give the mean measurements of two adult male crania from Kapiti, which yield the following indices:—Cephalic index, 76·3; vertical index, 75·1.

[3] In the description of the New Zealand crania in the earlier part of the Report (p. 77), I have omitted to state that in the skull from Marlborough the temporal ridge mounted in a remarkable manner to near the vertex, so that on the left side its summit was only 20 mm., and on the right side 22 mm. from the sagittal suture.

various facts is that the study of the crania supports the view that New Zealand had been occupied by a dolichocephalic and probably Melanesian race, before the Polynesian element was introduced into it.

The origin of the Chatham Islanders is shrouded in mystery. The massacre of so large a portion of these islanders by the Maoris before Europeans had become well acquainted with them, has interfered with our obtaining much information on their traditions. It is believed, however, that the Morioris are the result of an intermixture of Polynesians with Melanesians. It is said that they are shorter and stouter than the Maoris, darker in the skin, with lank black hair, aquiline noses, and a Jewish cast of countenance,[1] and that they can be readily distinguished from the Maoris. From the description of their crania in the earlier part of this Report (p. 73), it will be seen that they are in the lower term of the mesaticephalic series, and that the vertical index is less than the cephalic. Their breadth index was somewhat higher than the New Zealanders, and their nasal index was somewhat lower, but in other respects the proportions of parts in the two series of crania closely corresponded. The slope downwards and outwards from the sagittal suture to the parietal eminences, and the vertical direction of the wall of the skull below the parietal eminence, gave to the New Zealand skull, though in a less degree, that pentagonal outline in the norma occipitalis which has already been referred to (p. 73) as so marked in the Chatham Islanders. The characters of the skulls of the Morioris are such as might well be referred to a mixture of the Polynesian with the Melanesian race, and it is possible that, as in New Zealand itself, the Polynesian settlers may have found this group of islands occupied by a Melanesian people, and have intermingled with them.

From this summary of the proportions of the skulls of the people occupying the Polynesian area, it would appear that there is great diversity in the relation of the length to the breadth of the cranium, so that brachycephalic, mesaticephalic, and dolichocephalic crania are found amongst them. In some localities in the Melanesian area, more especially in and near New Guinea, a similar diversity was described, though the dolichocephalic type predominated, and in such localities as the mountains of Fiji and the Admiralty Islands seemed to be the exclusive form. These modifications in the relation of length to breadth in the Melanesian area were ascribed to a mixture of other races with the prevailing Papuan stock, and the question now arises whether a mixture of some other race or races with the proper Polynesian stock has taken place so as to have caused a modification in the form of their head.

If we assume that the type form of the skull in the Polynesians is brachycephalic, then, so far as our present material for observation admits of conclusions to be drawn, we may say that the Tonga Islanders present this type in its purest form. But if we pass from these islands to the groups situated either north, south, east, or west, then along

[1] Mr. E. A. Welch's account of these people in *Anthropological Review*, vol. viii. p. ci., 1870.

with brachycephalic crania others are intermingled which have mesaticephalic and even dolichocephalic proportions. From what quarter then has the race proceeded which has given this more pronounced length to the skull? There can, I think, be little doubt that this is due to a mixture with a Melanesian element. What the relation may be as regards time when the Polynesians and Melanesians first colonised their respective islands, which in short is the older race, is of course very difficult to say, though I am inclined to think that the Melanesians have the greater antiquity. Various considerations might be advanced in support of this position. The proficiency of the Polynesians in agriculture, in native manufactures, in the art of carving, their songs and traditions, their treatment of women, their submission to the government of chiefs, and their religious observances, all point to the Polynesians as having reached a stage of civilization which places them in advance of the pure Papuans. But the fact that dolichocephalic heads are much more generally diffused throughout the Polynesian area, than are brachycephalic heads throughout the Melanesian area, points to the conclusion that the Pacific Islands generally were at some remote period inhabited by a dolichocephalic and probably Papuan race, which in several islands has been entirely replaced by the Polynesians, in others very much intermingled with them,—so that the present inhabitants are a mixed race,—whilst in others again it has retained its pristine purity. How extensive this diffusion has been is shown by the considerable proportion of dolichocephalic crania which have been procured from islands so far removed from each other as the Sandwich Islands in the North and New Zealand in the South Pacific. The people of Humphrey's Island in the Manaluki group, about 700 miles west of the Marquesas Islands, are said by the Rev. George Turner to be light brown eastern Polynesians, but the inhabitants of Penrhyn's Island, in the same archipelago, have been described by Mr W. L. Ranken[1] as tall, dark brown, with wavy hair sometimes frizzled into mops, and with prominent noses, all which characters are Papuan. Penrhyn's Island has been regarded as the most easterly home of the Melanesians. Although we know but little of the craniology of the remote and solitary *Easter Island*, and although the inhabitants are said to be Polynesians from Rarotonga,[2] yet the only skull from this island, so far as I know, in any collection, viz., that in the Museum of the College of Surgeons, has, according to Prof. Flower, a breadth index 69·1 and a height index 72·9. In both these particulars its characters are Melanesian and not Polynesian. The study of the crania in the Polynesian area has led me therefore to a conclusion similar to that arrived at by Mr W. L. Ranken from a consideration of other data, viz., that the South Sea Islands had been inhabited by Papuans prior to the Mahori colonisation.

The *Gilbert Islanders*, again, in the Micronesian area have apparently a large admixture of Melanesian blood. Of the twenty-two skulls in the Godeffroy Museum,

[1] *Journ. Anthrop. Inst.*, vol. vi. p. 231, 1877.

[2] Meinicke, Die Inseln des stillen Oceans, Zweiter Theil, p. 229.

principally from the islands Majuro and Apamama, measured by Krause, nine had a cephalic index below 75, and the remainder ranged from 75 to 79·5, and of these only six were above 77. In the sixteen skulls, the cephalic index of which was below 77, the vertical index exceeded the cephalic. In three of the crania above 77 the vertical index was less than the cephalic, and in two they were almost equal to each other. Three skulls in the Museum of the College of Surgeons measured by Flower had the cephalic index ranging from 73·1 to 76·5; the vertical index in one specimen was less, in another equal to, in a third greater than the cephalic. Five male crania in the Paris Museum are said by de Quatrefages and Hamy to have a mean cephalic index 73·4 and a mean vertical index 77·3; two female crania a mean cephalic index 75·8 and a mean vertical index 79·4. A large proportion of the Gilbert Island crania which have been examined possess therefore the hypsistenocephalic character of the Melanesian skull. Krause states that prognathism was prominent in only six crania. The study of the skulls of the Gilbert Islanders had convinced him that in them the presence of another type than that of a purely Papuan race could be recognised. The mixed racial characters of the people of these islands has also been referred to by Prof. Meinicke and Mr. A. R. Wallace. The people of Peru Island, one of this group, according to the Rev. G. Turner, state that their ancestors came from Samoa, and both persons and places have Samoan names.

The *Marshall Islanders*, to the immediate north of the Gilbert Islands, have contributed but few skulls to museums. Two are in the Godeffroy collection, the one with a cephalic index 75 and a vertical index 79·3, the other with a cephalic index 77·4 and a vertical index 80·3. What little we do know of their crania points therefore to a mixture probably of the Polynesian with the Melanesian type. Krause states that these skulls approach closer to the Caroline than to the Gilbert Islanders.

The *Caroline Islanders* are much more extensively represented in museums. Prof. van der Hoeven described in 1865 a collection of nine skulls, seven men and two women, believed to be natives of Oolea, one of these islands,[1] and an excellent abstract of his memoir was published by the late Dr. Barnard Davis.[2] The mean length of these crania was 182 mm., their mean breadth 126 mm., their mean height 142 mm.; the mean cephalic index is therefore 69·2, the mean vertical index 78. These skulls are long, narrow, and high; they are hypsistenocephalic, and all possess this character. The Godeffroy Museum possesses forty-six skulls from this group, including one from the Pelew Islands. Eight skulls from Ponapé and Nemma were (with one exception C.I. 76) distinctly

[1] Beschrijving van Schedels van Inboorlingen der Carolina-Eilanden, Amsterdam, 1865.

[2] *Anthropological Review*, vol. iv. p. 47, 1866. Mr W. P. Pritchard comments in the same vol., p. 165, on Dr Davis's memoir, and furnishes interesting information on the spiral tufts in the hair of the people of Oceania. He doubts whether the hair grows naturally in these tufts, with bare spaces between, and considers that the tufts are directly the result of an artificial process, and that both they and the "mop-head" can be and are produced both by the frizzly-haired Melanesians and straight-haired Polynesians. See on this point my observations on the hair of a New Zealand head in note on p. 108.

dolichocephalic; the mean cephalic index was 72·2, and the mean vertical index 75·8. Sixteen skulls from the Mortlock Islands had a mean C.I. 74 and a mean V.I. 79. Eighteen skulls from Ruk had a mean C.I. 75·5 and V.I. 77·4. Three skulls from Yap had a mean C.I. 78·5 and V.I. 79·1, whilst the only Pelew Island skull had C.I. 83·8 and V.I. 85·6. Thus, as Dr. Krause has pointed out, the form of the skull in the Caroline Archipelago changes materially from east to west. In the easternmost islands the crania are dolichocephalic of the Melanesian type, whilst the skull from the western Pelew is brachycephalic, and those from Yap are in the higher term of the mesaticephalic. In passing from east to west therefore the cephalic index gradually rises. The western islanders have come under the influence of a brachycephalic race, which is apparently not Polynesian but Malay or Negrito, and this accords with the observations of several travellers. But further, I may state that the crania with a low cephalic index had the vertical index relatively much higher, whilst in the mesaticephali they closely approached each other, and in the only brachycephalic skull, the vertical exceeded the cephalic index.

Crania from the small *Hermit*, *Anchorites*, and *Echiquier Islands*, which lie to the south of the Caroline Islands, and to the immediate west of the Admiralty Islands, are in the Godeffroy Museum. The only skull from Hermit has a breadth index 80·4 and a height index 73·6.[1] The skull from the Anchorites has a breadth index 79 and a height index 73·3. Two other skulls from the Anchorites in the Berlin Museum have been measured by Dr Rabl-Rückhard; the one had a breadth index 78·5, the other a breadth index 77·9 and a height index 78·9. The two Godeffroy skulls from the Echiquier Islands have the cephalic index respectively 74·1 and 78·6, and the vertical index 77·4, 80·5. Another skull from the Echiquier Archipelago is referred to by de Quatrefages and Hamy (p. 204), as having been described by MM. Incoronato and Tocco. Its antero-posterior maximum was 166 mm., its transverse maximum 135 mm., and its cephalic index 81·3. These crania are of course too few on which to base a generalisation, but they point to a considerable mixture of a brachycephalic race with the Melanesian element, which, from the proximity of these small islands to New Guinea, the Admiralty Islands, and New Britain, one would have expected to be the dominant race. The brachycephalic element in these cases is probably Negrito.

The general survey which I have now taken of the craniology of the Pacific islanders, and the evidence collected by MM. de Quatrefages and Hamy, although not so full as that now brought together in this Report, have established on a sufficiently broad basis the important fact that in comparatively few of these islands, or groups of islands, are the crania restricted to either a simple dolichocephalic or brachycephalic standard. Both forms do without doubt occur in their pure state, but along with them skulls of mixed or mesaticephalic proportions are not unfrequently

[1] Krause's measurements; but Virchow puts the height index at 74·4 (*Zeitschr. f. Ethnol.*, Bd. viii. p. 291, 1876).

mingled. These variations can be sufficiently accounted for on the theory that two distinct races, a dolichocephalic Papuan and a brachycephalic Mahori, are in some islands pure, in others mingled with each other, either in distinct colonies living side by side in the same island, or by intermarriage; though on the western side of the Pacific region the brachycephalic Malay and Negrito have without doubt exercised an influence in modifying the cranial and other characters of some of the islanders in that region. But this theory, although combining a large mass of facts, yet does not overtake all the ethnological problems presented by the study of the anthropology of this extensive and widely scattered archipelago. There are certain residual quantities, of which it is not possible to give a satisfactory explanation on the supposition that these are the only races which have ever occupied these islands. I refer more especially to the remarkable archæological monuments that have been found in certain of them. Of these the megalithic remains on Ponapé or Ascension Island; the megalithic platforms, stone houses, and colossal stone sculptures of the human figure on Easter Island, the curious cruciform stone platforms on Malden's Island, the megalithic dolmens on Rotumah, to the north of the Fiji Islands, and the megalithic monuments in Tongatabu and some of the Gilbert Islands are the most noticeable. The natives appear to have no traditions of the construction of these massive remains, and to be themselves unable now to erect similar objects. The question therefore arises, have they so far degenerated from some higher grade of intellectual development as to have lost both all memory of the deeds of their ancestors and the power of executing such works, or did these owe their origin to some pre-existing race which inhabited the Pacific region. We cannot look to Australia as a centre of migration to the northwards of a race possessing a higher culture and civilisation, capable of architectural design and execution, for the aboriginal Australians are in their intellectual development and knowledge of useful arts much below either the Polynesians or the Melanesians, and besides, they are not a sea-faring people. Neither does it seem probable that, if these remains had been constructed by early Polynesian settlers, all memory of them would have departed, for there is ample evidence on many of the islands inhabited by the Polynesians of the propagation by oral tradition throughout hundreds of years of the valorous acts of their great chiefs. Mr. W. Colenso has gathered[1] from the modern Maoris a most interesting set of legends which have been transmitted for centuries from father to son; the Rev. W. Wyatt Gill has collected traditions from the Hervey Islanders embracing five or six centuries;[2] and the Rev. George Turner tells us[3] that the Samoans trace the genealogy of the chiefs of the Malietoa family for twenty-three generations.

Various theories have been advanced as to the origin of the Mahoris or brown Polynesians. They have been regarded by a few as of American descent, and as having

[1] *Trans. New Zealand Institute*, vols. i. xi. xiii. xiv.
[2] *Journ. Anthrop. Inst.*, vol. vi. p. 7, 1877.
[3] Samoa a Hundred Years Ago, London, 1884.

diffused themselves over the eastern islands of the Pacific in the course of the trade winds. Most writers have regarded their origin as Asiatic. Some of these consider that they are derived from the Malays,[1] hence the term Malayo-Polynesian so often applied to them, others again consider that both the Polynesians and Malays sprang from a common Asiatic stock, and that they both migrated from this common centre along independent routes to their respective geographical areas. Mr. W. H. Ranken considers[2] that this stock was Mongolian, as oblique eyes are common in Samoa, and in Tahiti many a Chinese labourer might be mistaken for a native. Others again think that we are to look to Hindustan for the origin of the Polynesians. Others again have accounted for the people of the Pacific, both Polynesians and Melanesians, on the theory so ably advocated by Charles Darwin that the Pacific is an area of subsidence, "and its great wide-spread groups of coral reefs mark out the position of former continents and islands," and that "the races of men now inhabiting these countries are therefore most probably the descendants of the races which inhabited these continents and islands."[3]

Dr. Krause accounts[4] for the Melanesian people of the Pacific by supposing that in prehistoric times a great south oceanic continent existed, which extended from the east of Africa up to the Indian Ocean, from which the black race spread into both Africa and the South Seas, to their present habitat. The deep sea investigations of the Challenger, as well as the absence of characteristic continental rocks in Oceanic islands,[5] have, however, by the demonstration of the great depth of the Pacific and Indian Oceans, and by the apparent absence of any great changes in the bed of those oceans since Tertiary times, thrown great doubt upon the possibility of such an extensive continent ever having had any existence in either the Indian or Pacific Oceans.

As regards the hypothesis of Mr. Wallace—that the brown and the black peoples, the Mahori and Melanesian, are merely varying forms of one great Oceanic race, the diversities of which are to be accounted for from "the old but certain effects of the varying physical conditions which have resulted in the present state"[6] of the surface of the land in Oceania —it is difficult to understand wherein such varying physical conditions could reside in islands subject to such uniform or closely allied climatic conditions, as the New Hebrides and Tonga, even on the supposition that they had at one time been the tops of continental mountains, so as to produce in one a black-skinned, frizzly-haired, dolichocephalic stock, and in the other a brown-skinned, straight-haired, brachycephalic people.

[1] Amongst recent writers the Rev. S. Whitmee has most strongly advocated the affinities between the Malays and Polynesians (*Contemporary Review*, Feb. 1873).

[2] *Op. cit.*

[3] A. R. Wallace, *Trans. Ethnol. Soc. Lond.*, vol. iii. p. 196, 1864, and Malay Archipelago, vol. ii.

[4] Die ethnograph.-anthr. Abtheilung des Godeffroy Museum.

[5] Paper by Mr. John Murray, Coral Reefs, *Proc. Roy. Soc. Edin.*, April 5, 1880, also joint paper by the Abbé Renard and Mr. Murray, *Proc. Roy. Soc. Edin.*, vol. xii. p. 495, 1884, and *Nature*, vol. xxx. pp. 84, 114, 132, 1884.

[6] Man in the Malay Archipelago, *Trans. Ethn. Soc. of Lond.*, vol. iii. p. 213.

GENERAL SUMMARY.

It is perhaps scarcely necessary that I should remind the reader that the one hundred and forty-three crania described and tabulated in this Report are from aboriginal people, living in a state of uncivilisation, in Southern Africa, Southern America, Australia, and the islands of the Pacific Ocean. That they are uncultivated aborigines is, however, a fact which should not be lost sight of in connection with this general summary of their characters.

In the first place I shall refer to noteworthy individual peculiarities observed in these crania. No skull was metopic, though in a young male Australian, a Loyalty Islander, and in two New Guinea skulls traces of the frontal suture were seen in the glabella, and in the Mallicollese it extended as high as the ophryon. The non-persistence of the frontal suture in the adult skulls of savages has been referred to by other craniologists, and is to be associated with the growth in thickness and weight of the cranial walls, the comparative simplicity of the sutures of the cranial vault, and the tendency to ossification of the sutures in adult life, which can so well be observed in the skulls of Australians, Chatham Islanders, and African negroes. In no skull was the malar bone either wholly or partially divided into two by a suture.[1] Wormian bones were present in the lambdoidal suture in Fuegian, Bush, Australian, Admiralty, Sandwich, Chatham, and Loyalty Islanders, Mallicollese and New Zealand crania; in some cases they were of considerable size, and in one Chatham islander attained the magnitude of an interparietal bone. No specific ethnological signification attaches to the presence of these bones. I have seen large interparietal bones in many European crania, and the view that an interparietal bone, the os incæ of Tschudi, had some special significance as a character of the Peruvian skull has now for many years been abandoned.[2]

In the crania of three Australians, two Admiralty Islanders, two Sandwich Islanders,

[1] Much stress has been laid by Prof. Rolleston on division of the malar bone in the Bush skull (account of Bush skulls in his collected papers, *op. cit.*). In his memoir, as well as in Prof. Wenzel Gruber's monograph, Ueber das zweigetheilte Jochbein, Wien, 1873, a copious bibliography may be found. Subsequently Dr. A. B. Meyer has communicated to the Berlin Anthropological Society (*Zeitschr. f. Ethn.* Bd. xiii. p. 330, 1881) a paper on this subject. He has met with two skulls, a Parisian and a Saxon, in 898 crania examined.

[2] See my paper, On some Congenital Deformities of the Human Cranium, *Edinburgh Medical Journal*, July and August 1865.

two New Guinea skulls, and one New Zealander, a tongue-shaped process of the squamous temporal intervened between the parietal and alisphenoid and articulated with the frontal. In the skulls of a Fuegian, two Australians, four Admiralty Islanders, four Sandwich Islanders, two Chatham Islanders, a Loyalty Islander, a Mallicollese, and a New Zealander, epipteric bones were found in the pterion on one or both sides. Owing to the squamoso-frontal articulation in the region of the pterion being a common character in many though not in all of the anthropoid apes, the occurrence of a similar articulation in the human skull has been regarded as a mark of degradation. In a paper which I wrote on the skull of the Gorilla, nearly twenty years ago,[1] I showed that the squamoso-frontal articulation although very common was not constant in the skulls of anthropoid and other apes, and that it might occur not only in the crania of savage man, *e.g.*, Negro, Hottentot, Caffre, Bushman, Sandwich islander, and Australian, but also in Hindoos, Ceylonese, and Europeans, and I stated that it was to be regarded as an individual peculiarity and not a racial character. I also referred to the triquetral bones occasionally present in the spheno-parietal suture as an approximation to this arrangement. Shortly afterwards Dr. H. Allen published observations on the Morton collection in Philadelphia,[2] and pointed out that twenty-three of the eleven hundred skulls in that collection had this articulation, viz., twelve Negroes and one each of the following:—Anglo-Saxon, Pelasgic, Swede, Chinese, Hindoo, Bengalese, Mandar, Seminole, Blackfoot and Iroquois Indian, and Esquimaux. Important memoirs on this subject have subsequently been written by Hyrtl,[3] Wenzel Gruber,[4] Calori,[5] Virchow,[6] Zuckerkandl,[7] Ranke,[8] Retzius,[9] Anoutschine,[10] Stieda,[11] and Schlocker.[12] In connection also with the non-articulation of the ali-sphenoid with the parietal, the presence and frequency of small triquetral or epipteric bones in the pterion has been inquired into, and the result has been to extend still further our knowledge of the races and varieties of men in which either a squamoso-frontal articulation or epipteric bones have been seen, so that now there is scarcely a race or variety in which they have not been described.

In each group of skulls, except the Fuegian, specimens occurred in which a suture

[1] *Proc. Roy. Soc. Edin.*, January 16, 1865.
[2] *Proc. Acad. Nat. Sci. Philad.*, No. 1, p. 137, 1867.
[3] Vergangenheit und Gegenwart des Museums an der Wiener Universität, 1869.
[4] *Mém. Acad. Sci. St. Petersb.*, 1874.
[5] Sull' anomala sutura, &c., Bologna, 1874.
[6] *Abhandl. d. k. Akad. d. Wiss. Berlin*, 1875; and *Zeitschr. f. Ethnol.*, Bd. xii. p. 1, 1880.
[7] Reise der Novara, Anthrop. Theil., p. 110, 1875.
[8] Beiträge zur Anthrop. u. Urgeschichte Bayerns, Bd. i., 1877.
[9] Finska Kranier, Stockholm, 1878.
[10] *Bull. de la Soc. d'Anthrop. de Paris*, 1878.
[11] *Archiv f. Anthrop.*, Bd. xi. p. 110, 1879.
[12] Anomalien des Pterion, *Inaugural Dissertation*, Dorpat, 1879. In addition to the above, isolated cases of squamoso-frontal articulation had previously been observed by Meckel, Owen, Henle, and von Baer.

extended from the infra-orbital foramen into the infra-orbital canal and floor of the orbit.[1] Although the presence of an infra-orbital suture, as will have been gathered from the descriptions in this Report, is a by no means uncommon occurrence in the human skull, yet very little attention has been given to it by anatomists. Prof. Wenzel Gruber has indeed, in a memoir on the infra-orbital canal,[2] figured in one skull a suture extending from the infra-orbital foramen through the lower border of the orbit into an anomalous infra-orbital canal, and a similar suture has been figured but not described by Virchow.[3] The peculiarity of the special fronto-maxillary articulation in the inner wall of the orbit in a Bush skull, and of a division of the parietal bone in an Admiralty Islander, have already been described in the Report (pp. 12, 57). Paramastoid processes occurred in a Bush, a Fuegian, two Sandwich Islanders, and a Chatham Islander. A mesial third occipital condyle was present in an Admiralty Islander, a Sandwich Islander, a Chatham Islander, and a New Zealander. Dr. H. Allen states that in the Morton collection of crania ten specimens possessed a third occipital condyle, and Dr. Barnard Davis also mentions several specimens in his collection as possessing it. The spheno-pterygoid foramen was seen in the skulls of two Sandwich and a Chatham Islander. In some other specimens although the external pterygoid and sphenoidal spine were not quite continuous, yet they so closely approached that in the living head they had probably been connected by a fibrous band, the pterygo-spinous ligament of Civinini.

Exostoses from the wall of the external auditory meatus were found in four Sandwich Islanders, a Chatham Islander, and a New Zealander. From observations which I have elsewhere recorded on this subject,[4] I was at that time led to state that there was a tendency to the development amongst the aborigines of America of modifications in the configuration of the external auditory passage. If, along with the crania described in this Report, we were to include the Marquesas Islanders described by Prof. Welcker [5] and Dr. Barnard Davis,[6] and the Sandwich and Loyalty Islanders in the collection formed by the latter craniologist, we should also be justified in saying that exostoses in this locality are not uncommon amongst the South Sea Islanders. The skull from the Admiralty Islands, with the remarkable deficiency of the nasal bones, exhibited a rare though not a unique malformation, as Van der Hoeven has referred[7] to a similar condition in a Bush skull, and the skulls of two African negroes in the Barnard Davis collection[8] have no nasal bones. The general absence of decay in the teeth, notwithstanding the frequent

[1] I have omitted, I find, in the description of the Bush crania, to refer to this character, but this suture was present in one skull of that race.

[2] *Mem. Acad. Sci. St. Petersb.*, 1874.

[3] Niedere Menschenrassen, *Abhandl. d. Berlin Akad.*, pl. vi. fig. 1, 1875.

[4] On Exostoses within the external Auditory Meatus, *Journ. of Anat. and Phys.*, vol. xiii. p. 200.

[5] *Archiv. für Ohrenheilkunde*, vol. i.

[6] Thesaurus Craniorum, and Supplement.

[7] Catalogus Craniorum, No. 165, p. 58, 1860.

[8] Thesaurus Craniorum, pp. 206 208, Nos. 1461, 1066.

exposure of the dentine as a result of use, is in accordance with the observations of many craniologists, that primitive man is much less subject to diseases of the teeth than man in a more civilized condition.[1]

Of the several peculiarities above described, some, such as the presence of an interparietal bone, a squamoso-frontal articulation in the pterion, a maxillo-frontal articulation in the inner wall of the orbit, a spheno-pterygoid foramen, and paramastoid processes are arrangements which are normal in various mammals though not in man. When they appear in the human cranium they are reversions to a lower type, and it is not without interest to consider if such reversions occur more commonly in savage than in civilised races.

The one hundred and forty-three crania described in this Report were collected without any reference to individual anatomical peculiarities, but simply as the skulls of races of men, which happened to come in the way of myself and other collectors. But amongst them, although their number is certainly too limited to base any broad generalisation on, as to the relative frequency of occurrence of particular variations in the different races, there is obviously a larger proportion of important variations than would occur in a corresponding number of skulls of the white races. Take the squamoso-frontal articulation, for example. It was seen in ten skulls, whilst epipteric bones were present in sixteen crania, which gives for the squamoso-frontal joint a proportion of 7 per cent., and for the epipteric bones a proportion of 11 per cent. This proportion is very much larger than was observed by Prof. Ranke in a series of two thousand four hundred and twenty-one crania of old Bavarian people, in which forty-three specimens had a complete articulation of the frontal with the squamoso-temporal, being in the proportion of 1·7 per cent. Virchow has added to Ranke's series of old Bavarian skulls observations on upwards of one thousand collected from other parts of Germany, so as to make a total of three thousand six hundred and ten German skulls, in 1·6 per cent. of which this articulation occurred. Calori also found this articulation in Italian skulls ten times in one thousand and eighteen specimens, or 1 per cent. Wenzel Gruber observed it in sixty crania in his collection of four thousand specimens. These crania represented different nationalities of Russia, and were probably for the most part Sclavonic, and the proportion is 1·5 per cent. These observations give a proportion of something less than 2 per cent. of European crania in which the squamous-temporal articulated with the frontal. We have no correspondingly large observations on the coloured races, but the frequency with which this variation has been noticed in certain of them shows that it is not uncommon. I have already referred (p. 116) to Dr. Allen having seen it in twelve Negroes in the Morton collection, which, judging from Dr. Aitken Meigs's Catalogue,[2] contains one hundred and seventeen negro skulls. Ecker found it ten times in the series of fifty negro crania in

[1] See especially the remarks made by Prof. Rolleston in British Barrows, p. 701.

[2] Philadelphia, 1857.

the collection in the Freiburg Museum. Anoutschine puts its occurrence in the negro skull at 12·8 per cent. He also gives its proportion in the Papuan skulls, based on the observations of A. B. Meyer and Mantegazza on three hundred and thirty-six skulls, at 6·9 per cent., and on thirty-nine crania examined by himself at 5·1 per cent. Flower found it in the Australian skulls examined by him in the proportion of 9 per cent.,[1] but Virchow, who has summarised[2] observations by various authors on one hundred and forty-two Australian crania, places it at 16·9 per cent. On the other hand the squamoso-frontal articulation does not appear to have been seen in any Tasmanian skull. Anoutschine gives the proportion of its occurrence in one hundred and eighty Polynesian crania at 3·3 per cent. and in one hundred and sixty-six Malay skulls at 4·8 per cent.[3]

The spheno-pterygoid foramen is also a variation of considerable interest in the human skull. It was seen with complete osseous boundaries in three of the skulls on which I have reported. A memoir on this foramen has recently been written by Dr. Eugen Roth,[4] who states that he has seen it with complete bony boundary ten times in two hundred and seven European crania, *i.e.*, 4·8 per cent. He puts its percentage with partial and complete bony walls, amongst exotic crania very much higher, 32 per cent. in Asiatics; 50 per cent. in Australians and Papuans; 30·6 per cent. in Africans; and 20 per cent. in American Indians, but the number of skulls of these coloured races which he has examined is far too small on which to frame any sound generalisation.[5]

In addition to the measurements of the crania recorded in the several Tables printed in the early part of this Report, I selected at least one characteristic specimen of each group of skulls, and bisected it longitudinally and vertically immediately to one side of the septum nasi and mesial plane of the cranial cavity. A careful rubbing was then taken of the outline of the section of each skull, and on this several lines were drawn and angles measured. As to the importance of this method of studying the skull I am quite in accordance with Profs. Huxley[6] and Cleland.[7] Indeed I may say that I had looked at the comparative anatomy of the skull from this point of view many years ago, when I

[1] Native races of the Pacific Ocean.

[2] *Zeitschr. f. Ethnol.*, Bd. xii. p. 20, 1880.

[3] Dr. Schlocker in his *Inaugural Dissertation*, Dorpat, 1879, "Die Anomalien des Pterion," discusses how the squamoso-frontal articulation arises, and this question is also considered by J. B. Sutton in *Journ. Anat. and Phys.*, vol. xvii. p. 220, 1884. It would seem as if an epipteric bone is normal in the development of the human skull, and usually joins the parietal to form its antero-inferior angle. If it fuses instead with the squamosal or frontal then it connects those bones and cuts off the parietal from the ali-sphenoid. Sometimes it remains up to adult life as a distinct epipteric bone.

[4] *Archiv f. Anthrop.*, Bd. xiv. p. 73, 1882.

[5] I may also refer to Dr. Krause's measurements of the skulls in the Godeffroy Museum, for several examples of this and the other forms of cranial variation described in the text.

[6] Two widely contrasted forms of the Human Cranium, *Journ. Anat. and Phys.*, p. 60, Nov. 1866.

[7] Variations of the Human Skull, *Phil. Trans.*, 1869; and Description of a Sulu Skull in *Journ. Anat. and Phys.*, p. 663, July 1877.

was working at the anatomical relations of the tentorium to the cerebrum and cerebellum.[1] The modifications in the thickness of the two tables and of the diplöe of the bones of the cranial vault, and the extent of the frontal and sphenoidal sinuses are revealed in such sections. It is interesting to observe that the massive skull of the Chatham Islander and that of the New Zealander had no frontal sinus in the glabella; in the Bush skull this sinus had both great vertical and lateral extension.

In the first place, I have drawn from a common centre a number of radii to definite points on the surface in the mesial line of the outer table. The centre I have selected is the basion, to the importance of which I have already referred in the introduction to this Report. I have also drawn a line in the plane of the foramen magnum and erected a

TABLE XVIII. (Plates VI., VII.)

RADII.	Bush. Umzimkulu.	Fuegian. D.	Admiralty Islander. A.	Oahu. D.	Hawaii. B.	New Zealand. Waikato.	Chatham Islander. A.	Queensland, Australia.	Gipps Land, Aust.	Australia.
Basi-occipital, . . .	94	108	110	110	103	96	106	113	105	104
Basi-lambdoidal, . . .	111	123	120	130	122	112	120	115	111	110
Perpendicular, . . .	129	139	147	147	146	138	144	132	126	128
Basi-coronal or bregmatic, . .	130	138	144	146	143	134	144	135	124	133
Basi-glabellar, . . .	107	111	106	113	108	110	121	108	101	114
Basi-nasal, ...	104	106	100	107	102	104	113	97	95	102
Basi-alveolar, ...	99	102	98	110	100	101	106	100	94	108
From perpendicular radius to most anterior part of cranial cavity, .	89	79	82	80	87	88	92	94	83	91
From perpendicular radius to most posterior part of cranial cavity, .	75	84	87	84	74	71	76	73	82	72

perpendicular from the anterior end of this line at the basion, which intersects the cranial vault at a point behind the bregma. This point varies within certain limits in different skulls according to the inclination of the plane of the foramen magnum, for it is thrown backwards or forwards according as that plane diverges from or approaches the horizontal plane of the head. Speaking generally, it may be said to touch the cranial vault in more or less close proximity to the spot which corresponds to the upper end of the fissure of Rolando.[2] In the Admiralty Islander it was 18 mm., in the Oahuan 19, the Fuegian 22, the Chatham Islander 23, the Hawaian 31, the New Zealander 34, the Bush 37, one

[1] *Proc. Roy. Soc. Edin.*, March 3, 1862. The drawings and tracings which I made at that time have not been published.

[2] See my papers On the Relations of the Convolutions to the Outer Surface of the Skull and Head, in *Journ. Anat. and Phys.*, vol. viii. pp. 142 and 359; also Mr. Hare's paper in the same *Journal*, vol. xviii. p. 174.

Australian 26, another 44, another 55 mm. behind the bregma. There are two factors which influence the relation of this point to the bregma, viz., the inclination of the plane of the foramen magnum and the relative length of the longitudinal arc of the frontal bone. This line I shall call the perpendicular radius, and the extent of cranial cavity which lies anterior to it, and in relation to the cranial vault, will approximately correspond to the frontal lobes of the cerebrum. I have constructed Table XVIII., in which is given the length of these different radii expressed in millimetres in the series of skulls which have been measured, and to them I have also added for convenience of reference the basi-nasal and basi-alveolar diameters obtained in the previous measurements by the callipers. The new radial measurements are as follows:—basi-occipital from basion to occipital point; basi-lambdoidal from basion to lambdoidal suture; perpendicular from basion to cranial vault perpendicular to plane of foramen magnum; basi-glabellar from basion to the most projecting part of the glabella; whilst the basi-coronal from basion to coronal suture, corresponds with the basi-bregmatic diameter.

From the perpendicular radius the distance was measured to both the most anterior and most posterior parts of the cranial cavity, and these measurements are also recorded in this Table. It will be seen that in the dolichocephalic Fuegian, Admiralty Islander, and Oahuan skulls, the extent of brain cavity behind the perpendicular radius exceeded that which was in front by several millimetres; in the mesaticephalic Bush, New Zealander, and Chatham Islander, and in the brachycephalic Hawaian, on the other hand, a larger proportion of the cavity was in front of than behind the perpendicular radius.

It would seem therefore as if in the formation of some dolichocephalic skulls, the growth takes place backwards, behind the plane indicated by the perpendicular radius, to a greater extent than in front of the same plane. This remark, however, must not be made too absolutely, for, owing to the plane of the foramen magnum not always possessing the same definite relation to the horizontal plane of the head, the perpendicular radius may, as already stated, be moved forwards and backwards. Thus in two of the three dolichocephalic Australian skulls measured in the above Table, where the plane of the foramen magnum sloped backwards, the frontal division of the cavity exceeded the occipital by a number of millimetres; but in the dolichoplatycephalic Gippsland skull, where the perpendicular radius reached the cranial vault much closer to the bregma, the anterior and posterior divisions of the cranial cavity were nearly equal. It will also be seen that, in accordance with the development of the cranial cavity behind the perpendicular radius, the basi-occipital and basi-lambdoidal radii attained considerable magnitude in the dolichocephali, and in the brachycephalic and mesaticephalic skulls the basi-glabellar radius preponderated over the basi-occipital. The tapeinocephalic character of both the Bush and Gippsland crania is well shown by the shortness of both the perpendicular and basi-bregmatic radii.

Another relation to which my attention has been directed is the angle which a line

drawn from the basion through the basi-occipital and sphenoid bones to the sphenoido-ethmoid articulation in the anterior cerebral fossa, forms with a line from the same point in the sphenoido-frontal articulation drawn parallel to the cribriform plate of the ethmoid through the upper end of the ethmo-frontal suture. These lines, which I shall call the basi-occipito-sphenoid axis and the cribriform axis, and the angle formed by their intersection, the sphenoido-ethmoid angle, have been studied by Prof. Huxley,[1] and to the first of the two lines he has given the name of basi-cranial axis. Almost similar lines have also been drawn by Prof. Cleland[2] and named by him the middle base and the frontal base, whilst the plane of the foramen magnum he regards as the hindmost division of the base of the skull. The length of these lines expressed in millimetres and the angle formed by their intersection in the same skulls as those measured in Table XVIII. are given in Table XIX. The angle which the basi-occipito-sphenoid axis forms with the plane of the foramen magnum is named the foramino-basal angle in the same Table.

TABLE XIX. (Plates VI., VII.)

Collection,	Bush. Umzimkulu.	Fuegian. A.	Admiralty Islander. A.	Oahu. D.	Hawaii. B.	New Zealand. Waikato.	Chatham Island. A.	Australia. Queensland.	Australia. Gippsland.	Australia.
Basi-occipito-sphenoid axis,	59	64	64	66	65	69	70	59	55	63
Cribriform axis,	28	29	30	22	21	21	24	34	28	28
Sphenoido-ethmoid angle,	142°	139°	148°	148°	147°	154°	150°	136°	138°	138°
Foramino-sellar angle,	126°	125°	115°	123°	130°	140°	132°	129°	124°	127°
Foramino-basal angle,	147°	138°	143°	140°	146°	151°	146°	157°	139°	150°
Spheno-maxillary line,	72	79	72	73	69	72	79	79	72	85
Spheno-maxillary angle,	94°	89°	90°	101°	93°	92°	91°	91°	93°	93°
Base line,	136	137	128	140	135	135	144	130	127	136
Frontal chord,	113	109	121	113	113	112	122	118	102	108
Parietal ,,	113	111	127	104	114	106	108	121	115	119
Occipital ,,	91	103	96	111	103	96	103	99	87	91

The basi-occipito-sphenoid axis is not necessarily parallel to the plane of the surface of this part of the cranial base, *i.e.*, to the dorsum sellæ, so that the angle which it makes with the plane of the foramen magnum does not express how far the slope of the dorsum sellæ approaches or departs from the perpendicular radius. I have accordingly drawn a line parallel with the dorsum sellæ to cut the plane of the foramen, and have inscribed the angle formed by their intersection in Table XIX. as the foramino-sellar angle. It will be seen that the inclination of the dorsum sellæ to the plane of the foramen magnum exhibited a considerable range of variation in the series of crania measured. In the Admiralty Islander it approached closer to a right angle than in any of the others, whilst in the New Zealander it opened out to 140°. Very little variation in the foramino-sellar angle occurred in the three Australian skulls. The foramino-basal angle formed by the

[1] Two widely contrasted forms of Human Skulls, *Journ. Anat. and Phys.*, November 1866.

[2] Description of a Sulu skull, *Journ. Anat. and Phys.*, July 1877.

basi-occipito-sphenoid axis with the plane of the foramen magnum presented considerable variations in the different crania; in the Fuegian it was the lowest, 138°, and it reached its maximum in one of the Australians 157°, but amongst the three Australians it ranged from 139° to 157°. In each skull it was more open than the foramino-sellar angle in the same cranium.

The sphenoido-ethmoid angle presented considerable variation in these crania. Prof. Huxley, in speaking of his corresponding angle, which he calls the basi-ethmoid angle, states that it diminishes in proportion to the downward rotation of the cribriform plate, *i.e.*, in proportion to the departure of the human skull from the arrangement of that plate seen in the lower mammalia. But the cribriform axis is not the only factor in the formation of this angle, for the slope of the basi-occipito-sphenoid axis is not uniform in all crania, and the nearer that the latter axis approaches to the vertical the more would the sphenoido-ethmoid angle be diminished, just as if a downward rotation of the cribriform plate had taken place. Table XIX. shows that this angle possessed a considerable range of variation. It was most open in the New Zealander and Chatham Islander, whilst in the three Australians and the Fuegian it was almost uniform at from 136° to 138°.[1]

A line was also drawn from the spheno-ethmoid articulation to the most projecting point of the upper jaw-bone and named in the Table the spheno-maxillary line, and the spheno-maxillary angle, which it formed with the basi-occipito-sphenoid axis was measured. The spheno-maxillary line varied considerably in length in the several skulls. It was shortest, 69 mm., in the brachycephalic, mesognathic Hawaian, and it attained its maximum, 85 mm., in a dolichocephalic, prognathic Australian, the gnathic index of which was 105·8. It possessed also considerable length, 79 mm., in the Chatham Islander and Fuegian skulls, but in neither of these did the gnathic index exceed 98, so that these crania were not prognathic. There was comparatively little variation in the spheno-maxillary angle which, in the majority of the skulls measured, exceeded by a very little a right angle, though in the Fuegian A it sank to 89°, and in the prognathic Oahuan D it rose to 101°. The projection of the upper jaw is not the only factor which affects this angle. Undoubtedly when the forward projection of this bone is considerable the tendency of this angle is to become more open, but should the slope of the basi-occipito-sphenoid axis at the same time approach the vertical then the angle would be relatively diminished. Hence I cannot regard this angle as giving an accurate measure of the degree of prognathism.

The base line from the back of the foramen magnum to the fronto-nasal suture, proposed by Prof. Cleland is also given in Table XIX., and as the total longitudinal arc

[1] Prof. Goodsir says that in man the cribriform side of this angle is, in well formed heads, horizontal. In the descending animal series this side rises so as at last to assume the rectangular position (see Lectures on the Dignity of the Human Body, in collected Anatomical Memoirs, vol. i. p. 258. Edinburgh, 1868).

of the vault of the several crania, except that of the Australian in the last column, has been given in the previous Tables under their respective headings, the relation as regards the relative length of the one to the other can be easily computed. Of the Australian skull, a male above referred to as excepted, I possess only one half, so that I have not included it in either Tables III. or IV., but I may state here that its total longitudinal arc is 374 mm.—the frontal 130 mm., parietal 125 mm., occipital 119 mm.

The chords of the frontal, parietal, and occipital arcs are also recorded in Table XIX. As Dr. Cleland has pointed out in his paper on the Sulu skull, the occipital arc possesses in dolichocephalic skulls a very pronounced curvature. The contrast between the curvature of that bone in the dolichocephali figured in Plates VI. and VII., and the corresponding bone in the brachycephalic Hawaian is very marked. There is obviously no relation between the length of the basi-occipito-sphenoid axis, and either the absolute length of the skull or its length relatively to its breadth. Thus this axis in the brachycephalic Hawaian varied only one millimetre in length from the same axis in the dolichocephalic Fuegian, Admiralty Islander, and skull from Oahu, and only 2 mm. from one of the dolichocephalic Australians, a result which accords with the observations made by Prof. Huxley on his two widely contrasted forms of skulls. As regards the relations of the transverse diameters of the side walls of the skull to the length of this axis, it will be seen that the stephanic and parietal diameters were greater in the Hawaian than in the Admiralty Islander, Fuegian, and Oahuan, but that the asterionic diameter, though greater in the Hawaian than in the Oahuan, was less in it than in the Fuegian and Admiralty Islander. It would seem therefore as if in brachycephalic as compared with dolichocephalic crania, a greater transverse growth took place in the frontal and parietal regions than in the occipital. The degree of what Prof. Huxley calls the anterior and posterior cerebral overlap may also readily be determined with the aid of the sectional diagrams in Pl. VI. and VII., and the posterior overlap is obviously less in the brachycephalic than in the dolichocephalic skulls.

I may supplement the remarks made in the Introduction on the method of taking the cranial capacity by stating that in the comparative measurements of each skull made by Mr. Jas. Simpson and myself, our measurements corresponded twenty-two times; on twenty-three occasions the difference between us was 10 cc., and in the remaining seventy-four the difference was between 2 and 8 cc. I think therefore it may fairly be assumed that any two persons carefully carrying out a series of observations on the cubic capacity in the manner I have recommended, ought to arrive at results closely corresponding with each other, which may be taken as giving a fair approximation of the internal capacity of the crania examined. The series of observations showed very decidedly that in these savage people the mean cubic capacity of the female skull was distinctly below the male.

Although my Tables do not record the breadth as well as the length of the foramen

magnum, I have taken both these dimensions in a large number of the crania. In far the greater number the length exceeded the breadth—in the Bush skull Chal. B. by as much as 12 mm.—but usually the difference between them was much less, sometimes not more than 1 mm. In one New Zealander and in one Chatham Islander these dimensions were equal. In one Admiralty Islander the breadth exceeded the length by 1 mm., in another by 0·5 mm.

Variations occurred in the series of skulls in the relative width of the face as estimated in the interzygomatic diameter, and that of the cranium in the parietal or parieto-squamous region. In the mesaticephalic Bush and Chatham Islanders, the brachycephalic Hawaians and Oahuans, and the dolichocephalic Admiralty Islanders, the rule was for the interzygomatic diameter to be less than the interparietal; in the male Australians as a rule the interzygomatic was the greater diameter, but in the Fuegians and New Zealanders these relative diameters varied in different crania. In many specimens the greater interparietal breadth was associated in the same cranium with a relatively large interstephanic breadth, so that the skull was cryptozygous; but this was not constant, so that in some of the crania examined the breadth in the parietal region was greater than the interzygomatic diameter, and yet the skulls were phænozygous.

The relative length of the frontal, parietal, and occipital arcs varied materially in the crania under review. As a rule the occipital longitudinal arc was the smallest of the three, but in the Fuegian and so called Patagonian group of skulls the occipital arc was in the majority of the specimens longer than either the frontal or parietal. The relative length of the frontal and parietal arcs was very inconstant. In the whole series of crania, except the New Guinea, the Loyalty and Admiralty Islanders and New Hebrideans, the tendency was for the frontal arc to exceed the parietal, but in the Melanesians it was the rule for the parietal arc to be longer than the frontal, and in the Loyalty Islanders very considerably to exceed it, so that this may be considered as a racial character of the Papuans. In a paper on Cranial Deformities, published twenty years ago, in which I discussed the mode of production of the scaphocephalic skull[1] I stated that one cranial bone might infringe upon the areas of adjacent bones if its ossification proceeded at a more rapid rate than theirs. This will doubtless account for the variations in the relative magnitude of the cranial bones, more especially those of the vault of the skull, in different individuals. For the fibrous primordial matrix in which these bones arise is continuous over the cranial vault, and does not have the limits of the several bones defined in it by sharp lines of demarcation. The ossific spicules, growing at a greater rate from a centre within one area than in the others surrounding it, would necessarily extend the area of the bone to which they belong and give it a greater superficial magnitude. It is probable that in those Melanesian crania in which the parietal longitudinal arc dominates so much over the frontal and occipital, that the parietal ossific centres are relatively more active than both

[1] *Natural History Review*, January 1864.

the frontal and occipital. Skulls which owe their dolichocephalic proportions to this dominating growth of the two parietal bones may appropriately be said to exhibit parietal dolichocephaly. The variations in the length of the arcs in the bones of the cranial vault will necessarily affect the cranial sutures, so that the coronal, squamous, and lambdoidal sutures will vary both in their direction and position within certain limits. As we have no evidence that the lobes of the brain grow commensurately with the bones of the cranium after which they are named, the relation which these lobes, and the fissures separating them from each other, will bear to the cranial sutures will also, as I[1] and others have elsewhere pointed out, vary within certain limits, and these variations will render it difficult to lay down, from an inspection of the surface of the head, absolutely fixed rules for the determination of the position of the cerebral fissures and convolutions.

TABLE XX.

	Bush.	Fuegians.	Australians.[2]	Admiralty Islanders.	Hawaians.	Oahuans brachycephali.	Oahuans dolichocephali.	Oahuans mesaticephali.	Chatham Islanders.	New Zealanders.	New Guinea.	South Sea Islanders.
Cephalic Index, . .	1·5	5·	9·	5·5	2·	5·	3·	4·	8·	11·	19·5	9·6
Vertical ,, . .	4·	3·5	11·	13·	4·	3·	9·	8·	7·	9·	7·5	10·
Gnathic ,, . .	9·4	3·	16·	18·	7·	5·	14·	11·	8·	11·5	13·	11·
Facial ,, . . .	7·	14·	17·	14·	6·	7·	12·	7·	9·8	21·	13·	12·
Nasal ,, . .	14·5	8·	14·5	17·	11·	12·	11·	10·	12·	20·	10·	4·
Orbital ,, . .	13·	10·	23·	19·	8·	23·5	16·	9·	15·	20·	18·	30·5
Palato-maxillary Index,	16·	6·	23·5	17·	10·	19·	27·	15·	13·	22·	32·	21·

The great importance which has been attached, in the later years of craniological research, to a determination of indices, by a comparison of two dimensions, leads me now to survey the several indices which I have computed in the preceding Tables, with the object of ascertaining which index shows the smallest range of variation in each series of skulls. For convenience of comparison I have arranged in groups in Table XX. the series of skulls examined, and the numerals express the range of variation in their several indices in the adults of each group. From this Table it will be seen that the cephalic and vertical indices showed the smallest amount of variation in each group. In the Bush skulls 1·5 expressed the range of the cephalic index, and in no group did it rise above 10, except in such mixed people as the New Zealanders, where it reached 11, and the New Guinea skulls, which included both brachycephalic and dolichocephalic races. The vertical index was remarkably constant in the Bush, Fuegians, Hawaians, and brachycephalic Oahuans, the range of variation not rising above 4. In the Australians the range was 11, owing to the presence of a proportion of dolichoplatycephalic crania, and

[1] See *Journ. Anat. and Phys.*, vol. viii. pp. 142 and 359.

[2] In estimating the range of variation of the cephalic index in the Australian skull, I have not included the scaphocephalic man from Portland Bay, or the mesaticephalic woman from West Victoria.

the range of 13 in the Admiralty Islanders was due to one skull having the unusually low vertical index of 64. As regards the sexes, my measurements generally confirm those made by preceding craniologists, who give to the female skull a less absolute and relative height than to the male. The gnathic index showed a much greater amount of variation in the several groups than the cephalic and vertical; in only five was the range below 10, whilst in the remaining seven it rose above that figure, and in the Admiralty Islanders was as high as 18. The greatest variation was, however, in the facial, nasal, orbital, and palato-maxillary indices, in which the range was seldom below 10; in several groups the range of one or other of these indices rose to 20, and in two instances to upwards of 30. In his important essays on the orbital and nasal indices[1] Paul Broca fully recognises the variations which may occur in these two indices, and, when writing on the nasal index, he states that it is subject more than most of the other characters to the perturbing influence of individual variations, so that valuable results can only be obtained by taking the average of a sufficiently large number of skulls. My observations on those groups, in which I had a sufficient number of crania of the two sexes, confirm the statement of Broca that in the same race the orbital index in the adult females is higher than in the adult males.

As the palato-maxillary indices in this Report are derived from the examination of the palato-alveolar arch in the crania of uncivilised races, it may be interesting to state the results of the length and breadth measurements of this region in a number of European crania. Twenty male skulls, consisting of ten Scots, five French, and five Germans, had a mean palato-maxillary index of 116·2, *i.e.*, they were brachyuranic, and the range of variation was from 103 to 138. Only three were below 110, *i.e.*, were dolichuranic; seven were between 110 and 115, *i.e.*, mesuranic, and the remaining ten were all above 115; one half, therefore, were brachyuranic, and as many of these had a high index, they raised the mean index of the crania measured. Eight female skulls, consisting of five Scots and three Sclavonic skulls, had a mean palato-maxillary index of 115·6; and they also were in the mean brachyuranic, and the range of variation was from 108 to 121·6. Only one was dolichuranic, three were mesuranic, and the remaining four were brachyuranic. The male and female averages corresponded, therefore, very closely with each other. The greatest length of the palato-maxillary arch in the series of European skulls was 60 mm. (male), and the shortest arch was 47 mm. (male), the widest arch was 69 mm. (two males), and the most contracted arch was 56 mm., both in a male and a female. In no specimen was the length of the region equal to the breadth.

In the series of skulls tabulated in this Report the Australians possessed the largest palato-alveolar arches. The longest arch in this race was 68 mm., and the shortest 48 mm., whilst the widest arch was 74 mm., and the most contracted 53 mm. The New

[1] *Revue d'Anthropologie*, 1875 and 1876.

Zealand crania also contained specimens of considerable magnitude, the longest arch was 62 mm., the shortest 49 mm., the widest was 69 mm., and the most contracted 57 mm. As a rule the breadth of the arch was markedly greater than the length, but in a few crania they approximated to each other and gave rise to a low palato-maxillary index. This was especially seen in the Australians (p. 39). One Admiralty Islander also had a palato-maxillary index of only 104, but the gnathic index in this specimen was moderate. In one dolichocephalic skull from Oahu the palato-maxillary index was only 103, and the gnathic index was moderate; in two others the length and breadth of this arch were equal, and in one of these the gnathic index was prognathous, in the other orthognathous. Although, as already stated in the description of the Australian crania, a dolichuranic palate is frequently associated with prognathism, it by no means follows that they should of necessity go together.

A long palato-alveolar arch is to be regarded as a sign of degradation of the human cranium, and this is the more marked when it is associated with relative narrowness and the consequent production of a low palato-maxillary index. In the anthropoid apes, for example, the length of this region in the adult skull is invariably considerably greater than the breadth, so that the palato-maxillary index is very low. Five skulls of the Gorilla in the Edinburgh University Anatomical Museum have a mean index of only 72, a single adult Orang has an index of 80, and an adult Chimpanzee an index of 82. In the young of the anthropoid apes, as I have determined from the measurements of three young Orang skulls in the same Museum, the length and breadth of the palato-alveolar region closely approximated, and the breadth in one even slightly exceeded the length, so that the index was considerably higher than in the adult. In the youthful stage of the human cranium, owing to the non-development of the true molars and the consequent shortness of the dentary arcade, the breadth of the arch is also greater in proportion to the length than in the adult skull, and the palato-maxillary index is very high. Illustrations of this may be seen in several of the young skulls, the measurements of which are given in the Tables.

Owing to the greater constancy of the cephalic and vertical indices in the same people, it follows that they are the most important features of study to guide the craniologist in his determination of the distinctive characters of races, for it is obvious that the less liable to variation any character is, the more does it stamp the race to which it belongs. The gnathic index ranks also very high as a racial feature, whilst the other indices to which I have referred are only of secondary importance. One cannot therefore but express a feeling of admiration at the acuteness of Anders Retzius, who so many years ago, and with much less refined methods than those employed in modern craniometry, seized upon the relation of the length to the breadth of the cranium, and on the relative amount of projection of the upper jaw as the foundation of his classification of the various races of mankind.

In upholding, however, a system of classification based upon these and other proportions of the skull, I do not wish it to be supposed that I undervalue the importance of other physical characters. The colour of the skin, the colour and character of the hair and eyes, the shape of the nose and lips, the stature, and the form of the pelvis, are all important factors in the determination of the distinctive physical features of races. To say that a series of skulls is dolichocephalic, or that another series is brachycephalic, is merely to express that they have in common a certain relation of length and breadth of the cranium, and by no means indicates that all the dolichocephali belong to one race only, and all the brachycephali to another. But I believe that by taking a combination of cranial characters we can lay down certain propositions as regards unmixed races of men, which, whilst allowing for the occurrence of occasional individual variations, will be as distinctive as those afforded by the study of any other series of physical characters. For variations occur in such characters, as in the cranium itself, and no more striking illustration could be given than the occasional appearance of an albino amongst the coloured races.

In unmixed races, where the skull is markedly dolichocephalic, brachycephalic skulls, one may say, never occur; and similarly in unmixed races, where the skull is markedly brachycephalic, dolichocephalic skulls are not met with. Hence even an unskilled observer would have no difficulty in distinguishing the skull of a Melanesian Loyalty Islander from that of an Andamanese, or that of an Australian from a brachycephalic Sandwich Islander. Similarly the dolichocephalic skull of an African negro, or of a Kaffir, may be readily differentiated from that of a mesaticephalic Bushman. Mixed races again are more difficult to deal with, especially if the mixture be that of a dolichocephalic with a brachycephalic race. For the people resulting from such a mixture will of necessity present many diversities in cranial form. Some will have heads which exhibit, with but little variation, the characters of one or other of the two parent types, but in others intermediate characters will arise, which may incline in some to those of one parent type, in others to those of the other. It is I think through the want of a due recognition of the effects which may be produced on the form of the head by this mixing of races that discredit has been thrown on the value of the skull in the determination of racial characters.

The question may be fairly discussed whether all unmixed races are either dolichocephalic or brachycephalic, and whether mesaticephalic people are invariably due to a mixture with each other of races possessing the two extreme types of head form. There can, I think, be no doubt that the dolichocephalic African negro, the hypsistenocephalic Melanesian, and the dolichocephalic Esquimaux, are all unmixed races. Their cranial and other physical characters are so decided that each of these people is distinctively differentiated from all other races. Similarly the brachycephalic Andamanese, Mongolians, and American Redskins are distinguished by definite characters from each other and from other races. I

have in previous pages given many examples to show how a mesaticephalic people may arise from a mixture of a dolichocephalic with a brachycephalic race. But there are instances of apparently unmixed races in which the standard form of the head is mesaticephalic. I may especially refer to the Bush race of South Africa, which has so many features distinguishing it from the surrounding people that it would seem to be a pure race, and it is not improbably the remains of the primitive people of the African continent. The Tasmanians were mesaticephalic, and it is possible also an unmixed race, though on this point I hesitate to give a definite opinion. I am not disposed, therefore, to limit the unmixed races to those which are either dolichocephalic or brachycephalic in their cranial proportions, but to include also certain of the mesaticephali.

From the examination of the Races of Men described in this Report, we have seen that in South Africa, in the southern part of South America, and in Australia, races of men exist distinguished by the small capacity of their crania, by their low intellectual development, and in the case of the Bushmen and Fuegians by their small stature and generally feeble physical configuration. The Australians also and the now extinct Tasmanians were under the average size of Europeans. In the islands to the south and east of the great Asiatic continent the Andamanese and other Negrito tribes are distinguished by their small stature, microcephalic crania, and low state of intelligence. It is not unlikely that these people may in the early unwritten periods of human history have had in their respective continents a much wider range of distribution than at present, and have been gradually pushed southwards into their present restricted areas by the advance of the races, more powerful in both intellectual and physical development, which we see around them. If in their displacement they failed to mix with their invaders their physical characters would remain pure. For isolation and interbreeding carried on through many centuries would necessarily preserve and even intensify the characteristic structural peculiarities of each race.

PLATE I.

PLATE I.

Fig. 1. Facial view of the skull of a Bushman from the mountain district at the source of the Umzimkulu river; one-half natural size (Table I.).

Fig. 2. Profile view of the same skull; one-half natural size.

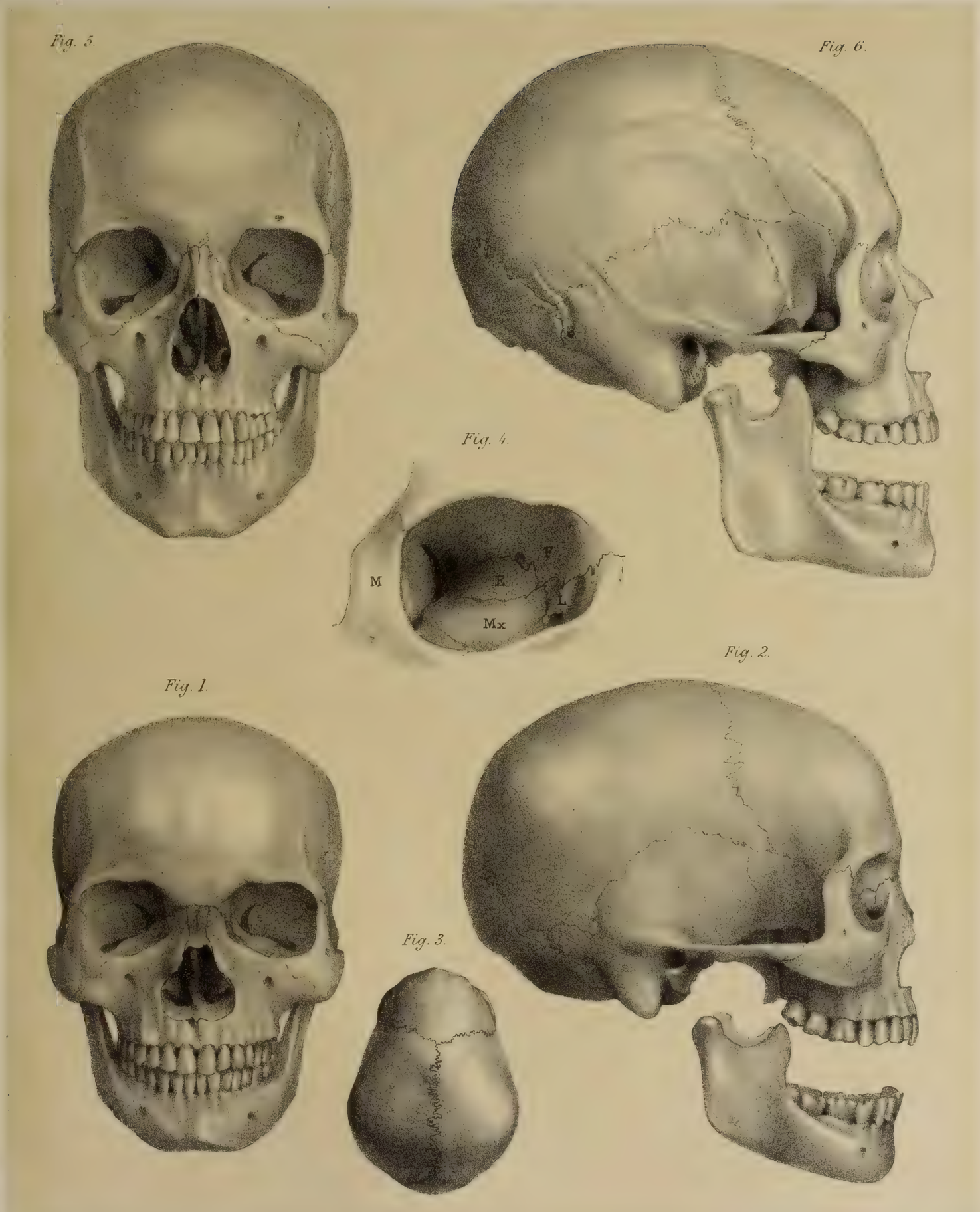
Fig. 3. Vertex view of the same skull; one-fourth natural size.

Fig. 4. Base and inner wall of the orbit of the same Bush skull, showing a direct articulation between the orbital plates of the maxillary and frontal bones.

E., Os planum of ethmoid.
L., Lachrymal.
Mx., Orbital plate of superior maxilla.
F., Frontal.
M., Malar bone.

Fig. 5. Facial view of the skull of the Fuegian D. (Table II.); one-half natural size.

Fig. 6. Profile view of the same skull.



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FIG^S 1-4, BUSHMAN. FIG^S 5&6, FUEGIAN.

PLATE II.

PLATE II.

Fig. 1. Facial view of the Australian skull from Riverina, New South Wales (Table III.).

Fig. 2. Profile view of the same skull.

Fig. 3. Facial view of the Australian skull from Roebuck Bay (Table IV.).

Fig. 4. Profile view of the dolicho-platycephalic skull, No. 1 from Gipps Land, Victoria (Table V.).

The whole of the Figures in this Plate are one-half natural size.

Fig. 1.

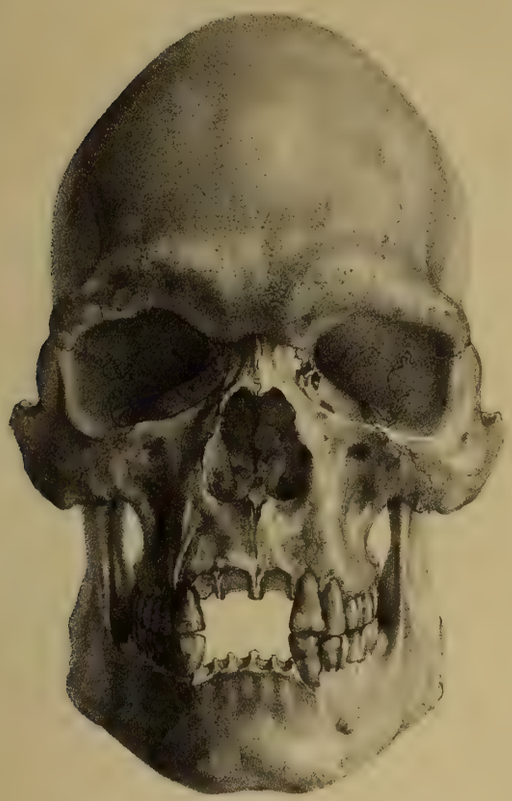

Fig. 2.

Fig. 4.

Fig. 3.

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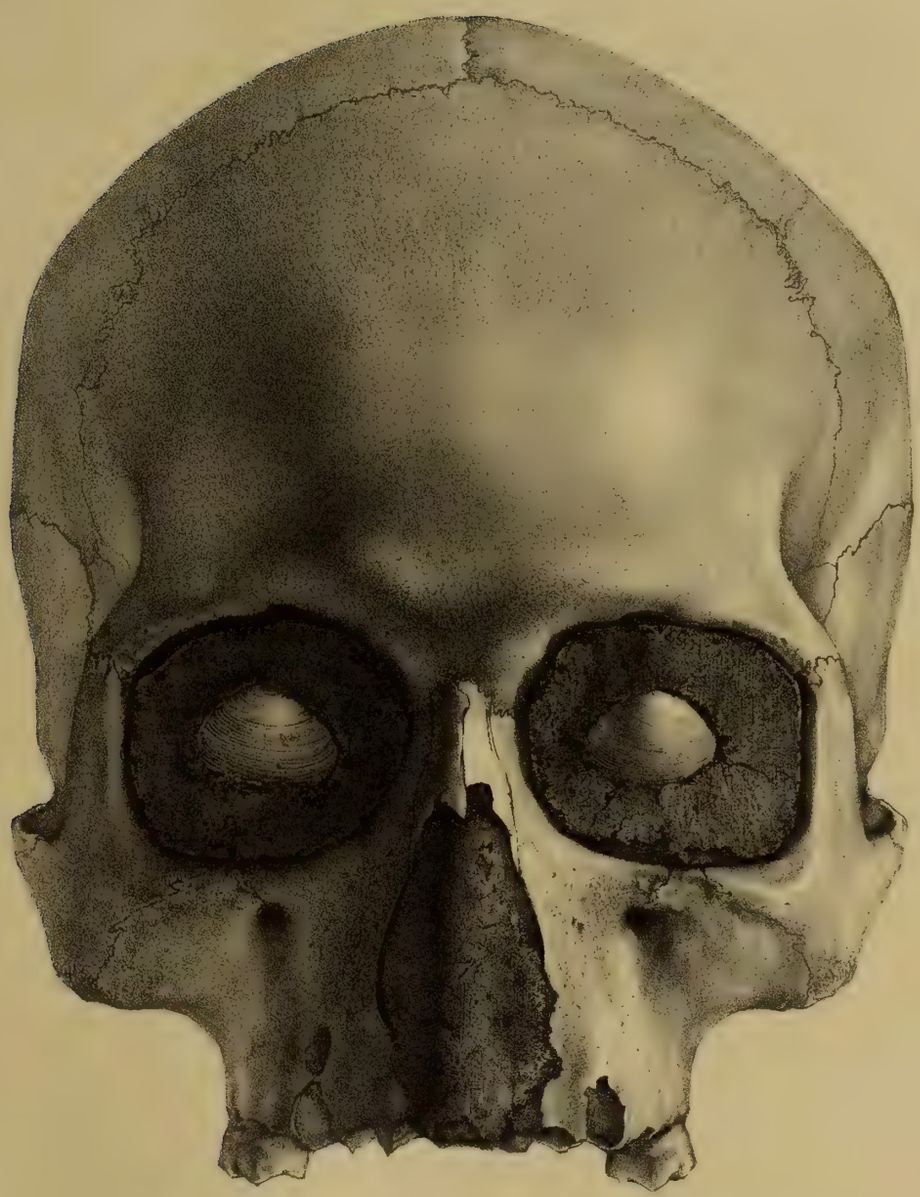
AUSTRALIANS.

PLATE III.

PLATE III.

Facial view of the artificially prepared skull of the Admiralty Islander D. (Table VIII.). In this skull a suture extended from the infraorbital foramen into the floor of the orbit. Natural size.



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ADMIRALTY ISLANDER.

PLATE IV.

PLATE IV.

Fig. 1. Profile view of the skull of the Admiralty Islander A. (Table VIII.); one-half natural size.

Fig. 2. Facial view of the skull of the Admiralty Islander C. (Table VIII.); one-half natural size.

Fig. 3. Nasal region of the Admiralty Islander in which the nasal bones were apparently absent E. (Table VIII.). In this skull a suture extended from the infra-orbital foramen into the floor of the orbit. Natural size.

Fig. 4. Profile view of the skull of the Admiralty Islander K. (Table VIII.), showing the division of the right parietal bone into an upper and a lower portion.

Fig. 4.

Fig. 3.

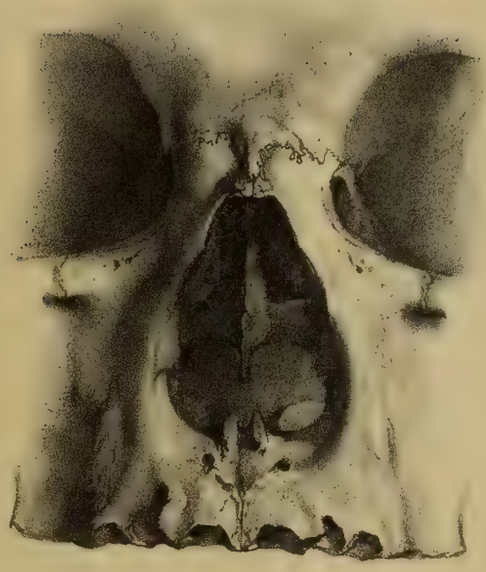
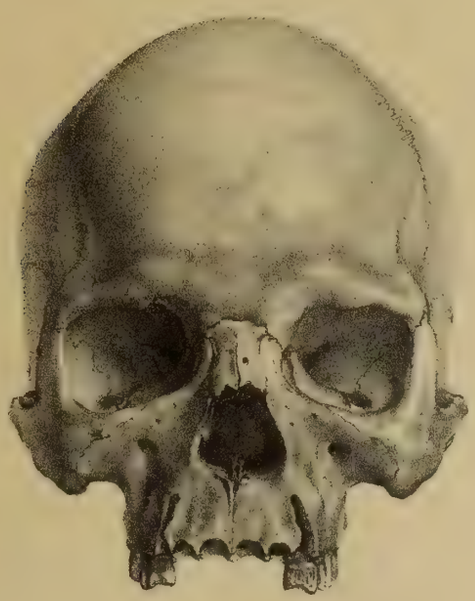


Fig. 1.

Fig. 2.



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ADMIRALTY ISLANDERS.

PLATE V.

PLATE V.

Fig. 1. Occipital view of the skull of the Admiralty Islander A. (Table VIII.).

Fig. 2. Vertex view of the same skull.

Fig. 3. Profile view of the skull of a Hawaian from Waimea Plains (Table IX.).

Fig. 4. Facial view of the same skull.

All the Figures in this Plate are one-half natural size.

Fig. 4.

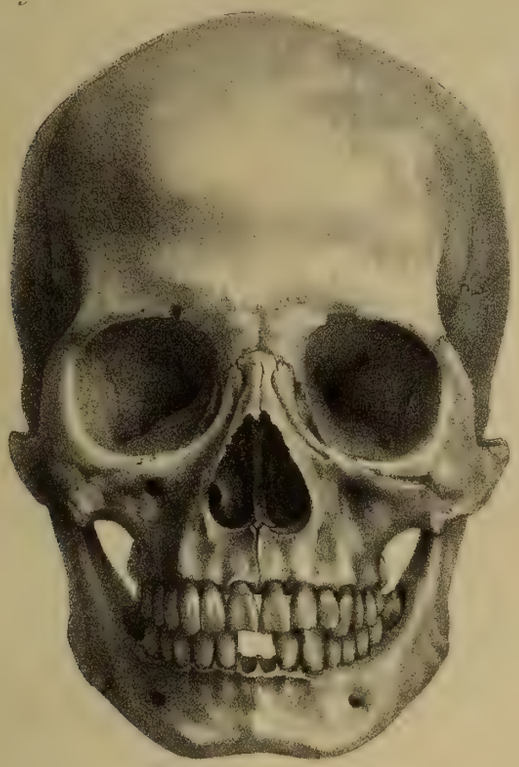


Fig. 3.

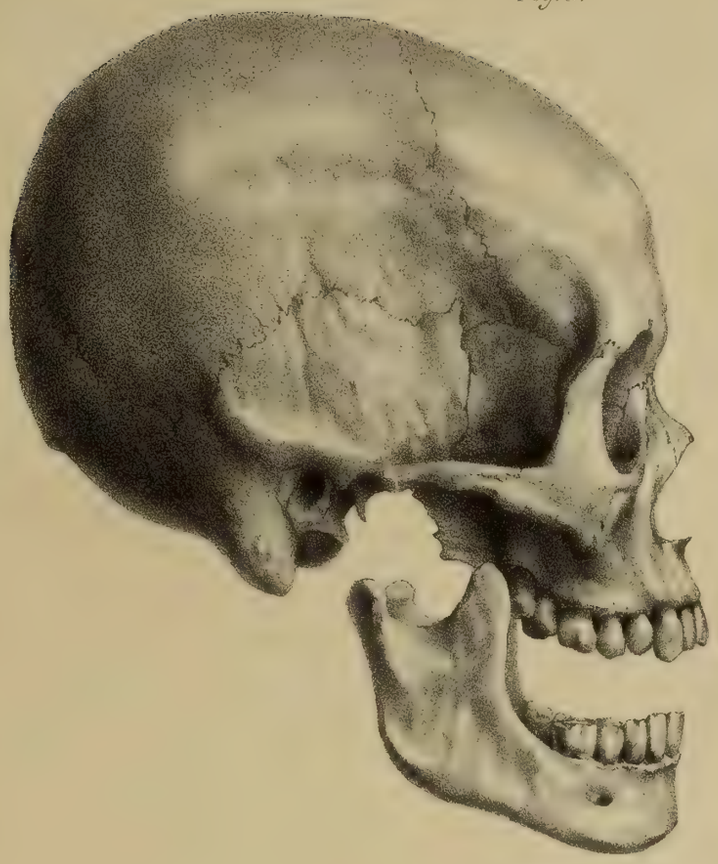


Fig. 2.

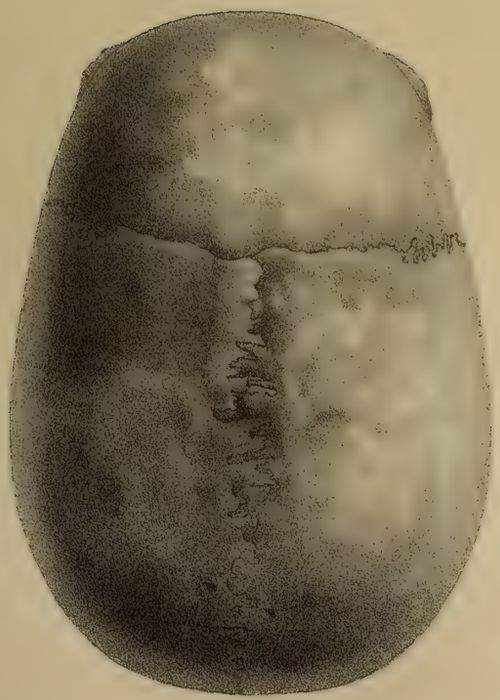
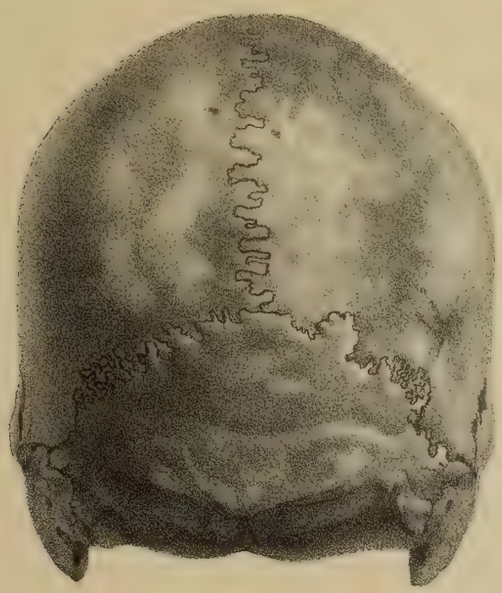


Fig. 1.



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FIGˢ 1 & 2, ADMIRALTY ISLANDER. FIGˢ 3 & 4, SANDWICH ISLANDER, (Waimea)

PLATE VI.

PLATE VI.

oc., basi-occipital radius.
l., basi-lambdoidal radius.
p., perpendicular radius.
br., basi-bregmatic radius.
g., basi-glabellar radius.

s., plane of dorsum sellæ.
os., basi-occipito-sphenoid axis.
cr., axis of cribriform plate.
sm., spheno-maxillary line.

Mesial antero-posterior sections of the following crania:—

Fig. 1. Bushman from Umzimkulu (Table I.).

Fig. 2. Fuegian D. (Table II.).

Fig. 3. Admiralty Islander A. (Table VIII.).

Fig. 4. Oahuan D. (Table XI.).

Fig. 5. Hawaian A. (Table IX.).

All the Figures in this Plate are one-half natural size.

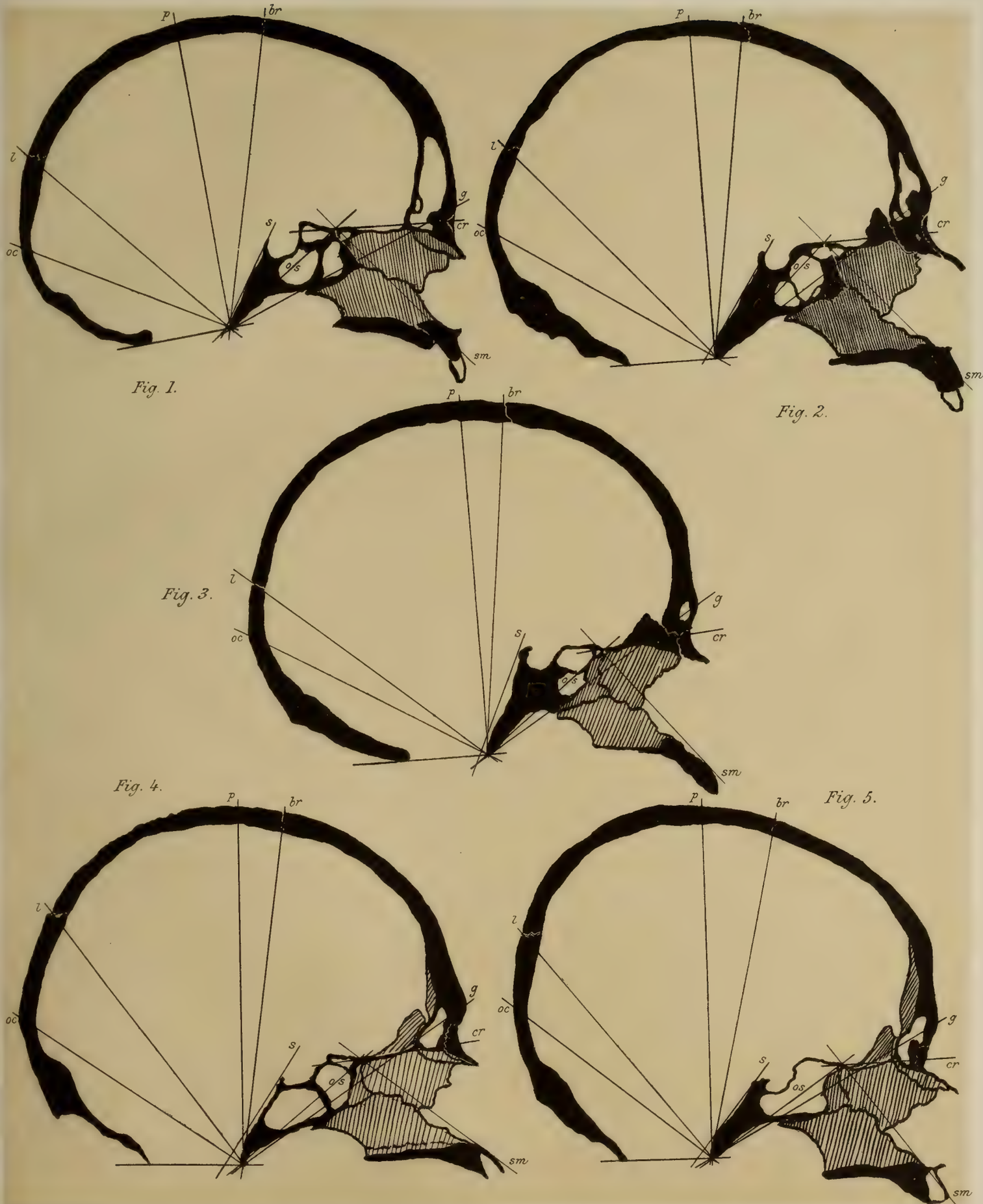

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

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Fig. 1, BUSHMAN. Fig. 2, FUEGIAN. Fig. 3, ADMIRALTY ISLANDER.
Fig. 4, OAHUAN. Fig. 5, HAWAIAN.

PLATE VII.

PLATE VII.

oc., basi-occipital radius.
l., basi-lambdoidal radius.
p., perpendicular radius.
br., basi-bregmatic radius.
g., basi-glabellar radius.

s., plane of dorsum sellæ.
os., basi-occipito-sphenoid axis.
cr., axis of cribriform plate.
sm., spheno-maxillary line.

Similar sections of the following crania:—

Fig. 6. Waikato, New Zealander (Table XIV.).

Fig. 7. Chatham Islander (Table XIII.).

Fig. 8. Australian.

Fig. 9. Australian from Gipps Land (Table V.).

Fig. 10. Australian from Queensland (Table III.).

Fig. 6

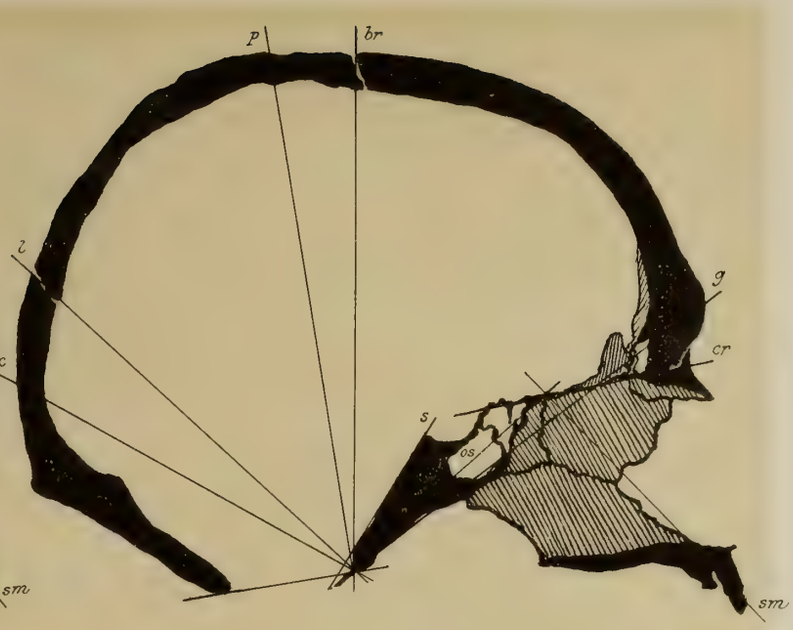


Fig. 7.

Fig. 8.

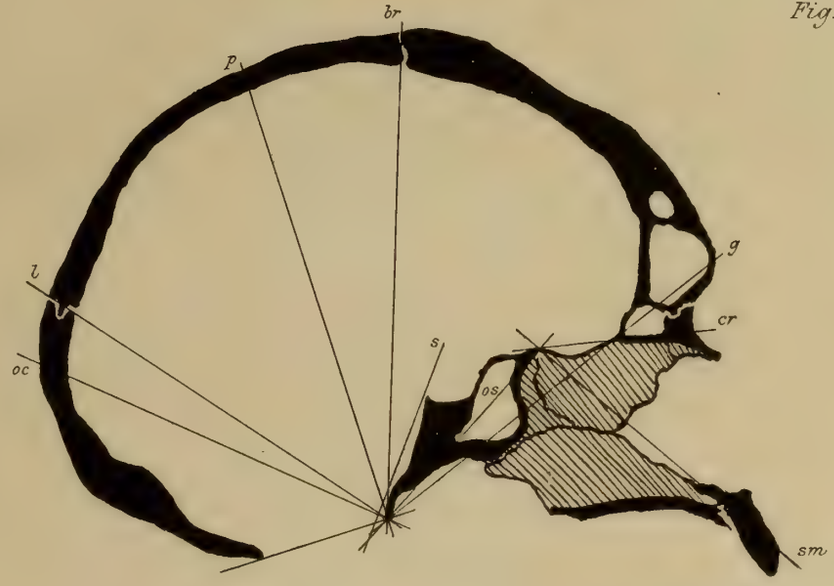


Fig. 9.

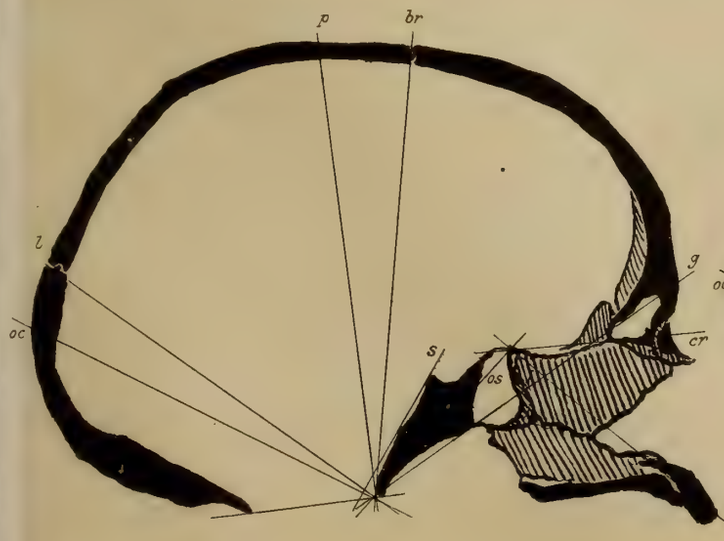
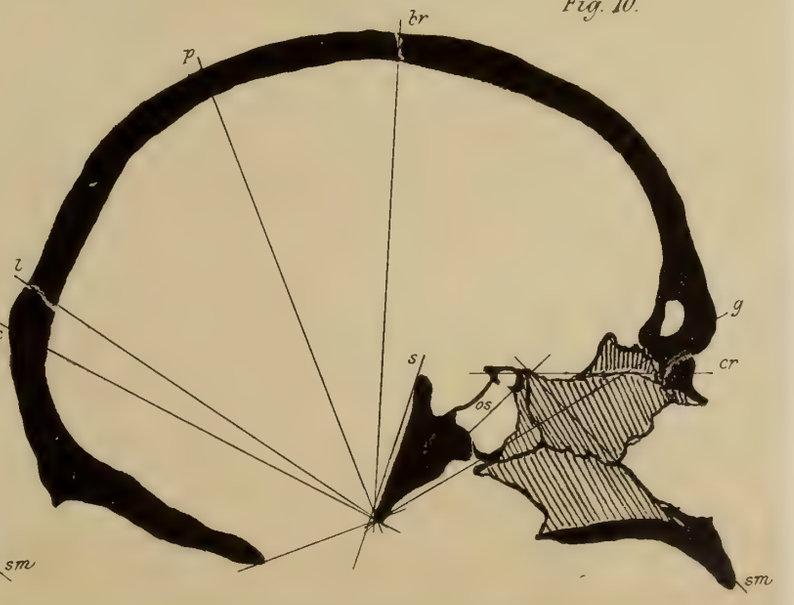


Fig. 10.



W Turner del.

F Huth, Lith^r Edin^r

Fig 6, NEW ZEALANDER. Fig 7, CHATHAM ISLANDER. Fig. 8, AUSTRALIAN.
Fig. 9, GIPPS LAND, AUSTRALIAN. Fig. 10, QUEENSLAND, AUSTRALIAN.

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